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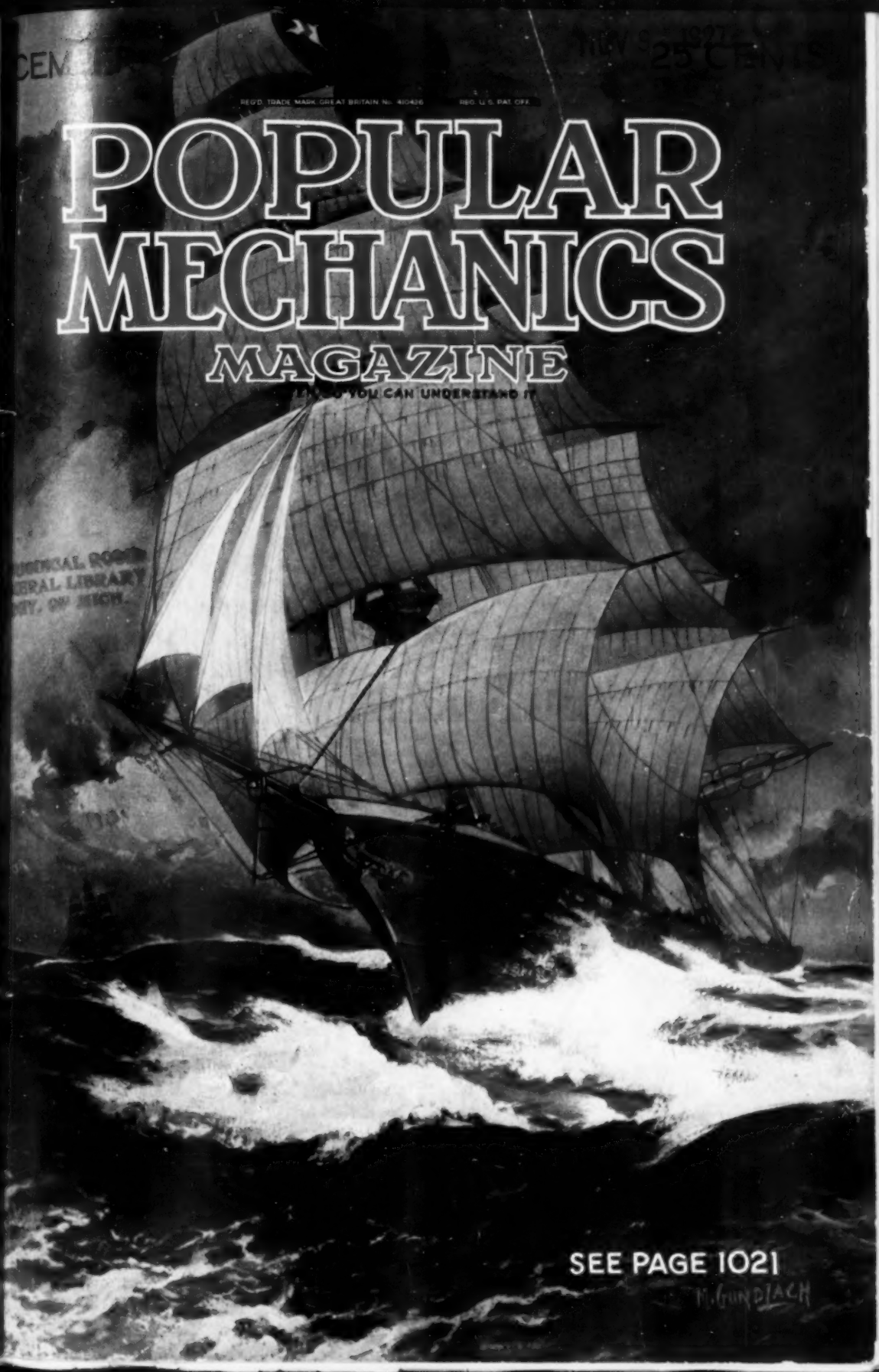
POPULAR MECHANICS MAGAZINE

LEARN HOW YOU CAN UNDERSTAND IT



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SEE PAGE 1021

M. GUNDLACH

Mr. Happy Man Says

"They Cut TWICE as Fast"

YOUR Hardware Dealer can show you the wonderful new ATKINS "Silver Steel" Hack Saw Blades for hand use. They revolutionize metal cutting—cut *twice* as fast, and last at least *six times* as long, as any other hack saw blade you ever used.

Think what a saving of time, money and effort this means. What it means to do a metal-cutting job in *half* the usual time—to have a hack saw blade that will outlast *six* ordinary blades! "Silver Steel" blades keep their teeth and will not snap.

You should be using these new blades NOW. Ask your hardware dealer for them. If he cannot supply you, write and tell us what kind of metal you are cutting, enclosing 25c, and we will send you a sample "SILVER STEEL" blade.

E. C. ATKINS & CO., *Est. 1857,* **426 So. Ills. St., Indianapolis, Ind.**

Leading Manufacturers of Highest Grade Saws for Every Use; Saw Tools, Saw Specialties, Plastering Trowels, Machine Knives, Grinding Wheels and Files.

At Your Hardware Store

Silent Magic

Here is the Eveready Layerbilt "B" Battery No. 486, Eveready's longest-lasting provider of Battery Power.

Radio is better with *Battery* Power

TURN your radio dial, and presto! you turn your home into a theater, a concert hall, a lecture room, a cabaret, a church, or whatever you will. Turn the dial and your attentive ear does the rest. That is all there is to this magic of radio.

Or almost all. If a radio set is to work at its very best, attracting no attention to itself, creating for you the illusion that can be so convincing, you must pay a little attention to the kind of power you give it. There is but one direction, a simple one—use Battery Power. Only such power is steady, uniform, silent. It is called by scientists pure Direct Current. Any other kind of current in your radio set may put a hum into the purest note of a flute, a scratch into the song of the greatest singer, a rattle into the voice of any orator.

Don't tamper with tone. Beware of interfering with illusion. Power that reveals its presence by its noise is like a magician's assistant who gives the trick away. Use batteries—use the Eveready Layerbilt "B" Battery No. 486, the remarkable battery whose exclusive, patented construction makes it last longest. It offers you the gift of convenience, a gift that you will appreciate almost as much as you will cherish the perfection of reception that only Battery Power makes possible.

EVEREADY Radio Batteries
—they last longer

NATIONAL CARBON CO., Inc.
New York San Francisco

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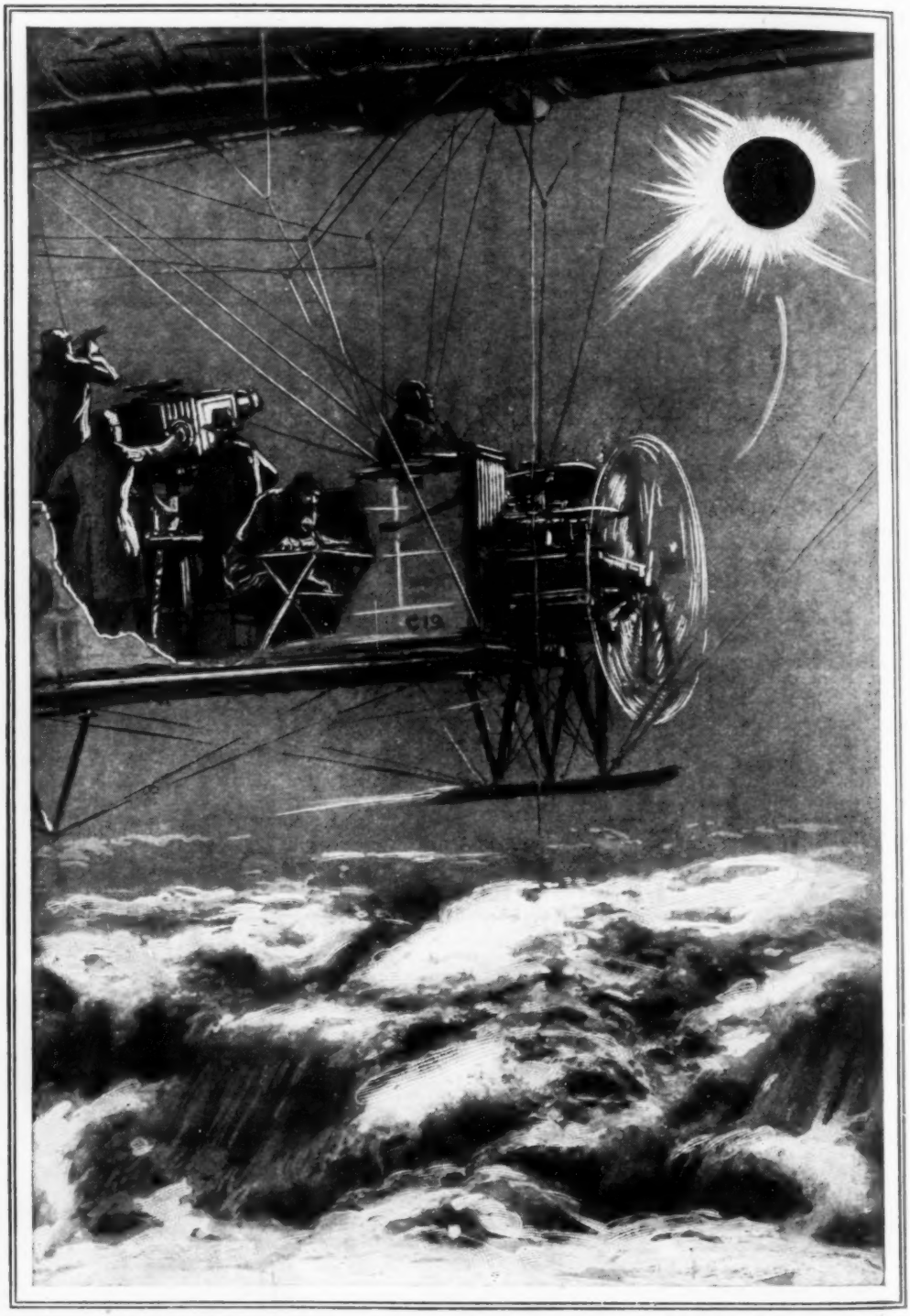
Tuesday night is Eveready Hour Night—9 P. M., Eastern Standard Time

WEAF—*New York*
WJAR—*Providence*
WEEI—*Boston*
WFI—*Philadelphia*
WGR—*Buffalo*
WCAE—*Pittsburgh*
WSAI—*Cincinnati*
WTAM—*Cleveland*
WWJ—*Detroit*
WGN—*Chicago*
WOC—*Davenport*
KSD—*St. Louis*
WCCO—*Minn. St. Paul*
WDAF—*Kansas City*
WRC—*Washington*
WGY—*Schenectady*
WHAS—*Louisville*
WSB—*Atlanta*
WSM—*Nashville*
WMC—*Memphis*

Pacific Coast Stations—9 P. M., Pacific Standard Time

KPO—KGO—*San Francisco*
KFOA—KOMO—*Seattle*
KFI—*Los Angeles*
KGW—*Portland*

The air is full of things you shouldn't miss



Airplanes and Dirigibles Have Rendered the Astronomer Independent of Clouds and Rain, Enabling Him to Take His Cameras Aloft to Cover Such Events as an Eclipse—See Page 962

Popular Mechanics Magazine
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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 48 DECEMBER, 1927 No. 6

A Fat Cure from Whales?

By H. H. DUNN

TWO scientists from the University of California are trying to learn the cause of extreme obesity in man, and the reason for the huge size to which whales grow. They believe, if they find the one, they will be on the trail of the other.

It is thought that whales, which are among the largest creatures which ever lived on earth, attain their great length and weight, and produce their thick layers of fat, because of the absence, or deterioration, of the pituitary and thyroid glands. It is known that failure of these glands to function properly in human beings produces either giants or dwarfs, excessively fat persons or exceedingly thin ones.

Whales range from the twenty-foot length, of a small variety found in New Zealand waters, to the ninety to 100-foot sulphur bottoms, or bluebacks, of the north Pacific. They weigh an average of one ton for every foot of length. Scientists say that, while the whale is admirably adapted to the element in which it lives, there is no apparent reason for it to attain such size; that, in fact, the size is a handicap in its feeding, migrations and general success in life. They believe the whale during its development in past generations lost its pituitary and thyroid glands, either in whole or in part, or they became so altered that development of the mammals to their present size resulted.

If this condition is found to exist, and examination of hundreds of whales shows it to be general, similar experiments will be carried on with elephants and other large animals. The condition also will add another chapter to the scientific history of the influence of these two glands on human life, since the whale is as much of a mammal as man, whom it greatly resembles in structure, save for size.

If, on the other hand, the whale is found to possess the pituitary and thyroid glands, it is believed they will be of such large size as to form a new and valuable source of supply for the extracts, now used in the treatment of obesity and of excessive leanness in man.

The whales used in the experiments were hunted in the most modern manner, mechanical devices produced during the past ten years having brought an end to the old-time year-long voyages in sailing ships, and reduced the adventure and gam-

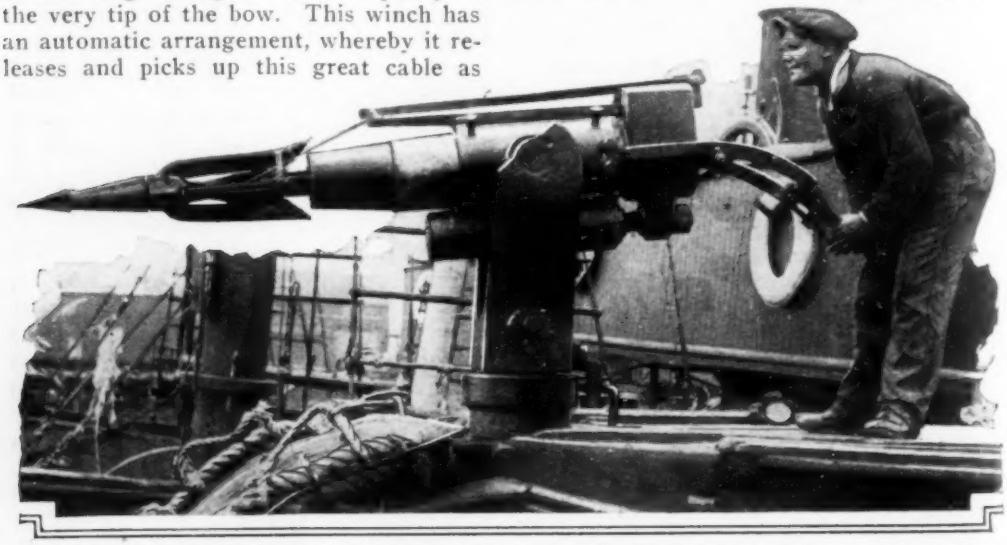
ble of whaling to an exact business. The small iron steamers—none of them more than 100 feet long, and many not so large as the whales they hunt—put out of Ensenada or Guaymas each morning, seldom proceeding more than twenty to forty miles from shore. A lookout goes into the crow's-nest on the mainmast of the little steamer, and watches for the "spout" of vapor which betrays the whale newly risen to the surface. At his cry, the steamer, which has a speed of twenty knots, as compared with the whale's maximum of fifteen, sets out in pursuit.

There is no lowering of longboats, with hours of pulling at the oars, as in the old days of whaling, and there is no danger to men or vessel, unless some huge and crusty old sulphur bottom decides to charge the steamer. The gunner takes the tarpaulin off the three-inch harpoon gun, set well forward in the bow, puts the charge of black powder in the breech, fits the 150-pound harpoon in the muzzle, and stands by his lanyard.

The head of the harpoon carries a killing charge of high explosive, with a time fuse, set to explode four seconds after the harpoon leaves the gun. Leading from the harpoon is twenty to thirty feet of heavy steel chain, rove into 3,000 fathoms (18,000 feet) of three-inch Manila cable, running to a steam winch below decks, and feeding through a slot and pulley in the very tip of the bow. This winch has an automatic arrangement, whereby it releases and picks up this great cable as easily and in the same manner as an automatic fishing reel takes care of the slack in a thin silk or linen line.

The wheel by which the steamer is steered is located in such a position that the helmsman, usually the captain, has an unobstructed view of the gunner and the sea ahead. As he approaches within shooting distance of the whale, he "lays" the ship "dead on" the quarry, just as a gun-pointer might lay his cannon on a target. The gunner then, so long as the captain holds the ship on her "point," attends to the depression or elevation of his piece, considering the roll of the ship and the roll of the whale. When the two rolls coincide, he pulls the lanyard.

If his aim is good, the harpoon strikes about ten feet back of the great head—whales have no visible necks—and penetrates to such a distance that the charge of explosive wrecks the heart before the monster can "sound." If all goes well, the whale is dead in a few minutes, the winch takes in the line and the thirty to 100 tons of flesh and bone and blubber are pulled alongside. A man, armed with a long, hollow-stemmed steel lance, connected with an air compressor, leaps to the back of the floating whale, drives the lance deep into its vitals and the body is pumped full of air. A flag bearing the name of the ship making the capture is stuck on a steel rod in the whale's body, which is



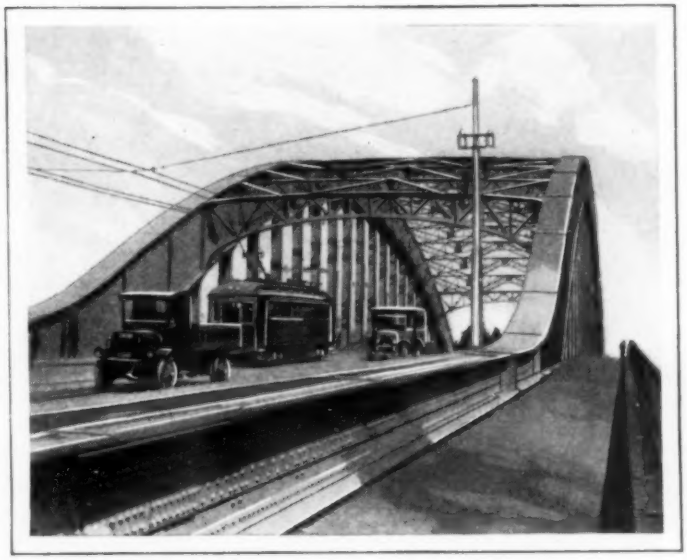
When the Lookout in His Barrel on the Masthead Cries, "There She Blows," the Gunner in the Bow of the Whale Ship Swings His Harpoon Around, Ready to Fire

then cast loose while the steamer goes after another, returning later to pick up its earlier kills.

If, however, the harpoon does not strike true, or the explosive fails to go off, the whale almost immediately sounds—that is, rears its huge flukes ten to thirty feet in the air, and dives. Contrary to whaling fiction, the whale seldom goes down more than 500 to 600 feet. A whale is able to remain under water not more than five minutes, being compelled to return, at the end of that period, to the top for air.

But the whale may come up half a mile from the whaler, whose three miles or more of cable still holds fast. Then pursuit is taken up again, the cable, drawn taut, making a drag of the ship against the strength of the whale. Now and then, one of the large whales, rising close to the little steamer, will charge the vessel blindly, and such a collision is fraught with danger to both men and boat. Sometimes, the whale will rise a mile or two away, but the weight of that length of cable, if the harpoon is well "sunk," soon wears down the big mammal's strength until it can be overtaken easily. The whales so taken are towed like so many barges or rafts, to a mother-ship, or, as in Monterey and Eureka, Calif., to shoreside cooking stations, where they are cut up and every bit of the carcass utilized.

The oil, however, is the principal product, being worth today around $1.40 a gallon, as compared with eighty cents at the height of the whaling industry in the late seventies and early eighties.



The Yeitai Bridge in Tokyo, Illustrating How Japan Is Keeping Abreast of the Times in Steel-Construction Methods

BUILDING PROGRESS IN JAPAN SHOWN BY STEEL BRIDGE

That Japan is keeping abreast of the times in construction methods is shown by the Yeitai bridge in Tokyo. It weighs more than 4,000 tons, is 600 feet long and eighty-four feet wide. The distinguishing features are the wide arched girders that support the lower part of the viaduct. At one place, these are fifteen feet wide. Steel bands replace the usual cables.

PULLING BARRELS UP STAIRS IS MADE EASY

To Simplify the Task of Hauling Barrels up Stairs; the Apparatus in Working Position

Pulling heavy barrels up stairs or taking them down is made safer and easier with a tackle apparatus introduced in France. It consists chiefly of a cable sling which is passed around the barrel and a geared drum by which the ropes are wound up or let out. By turning a crank, the load is easily drawn up the stairs and releasing the cables permits the barrel to descend.

Where Body Blows Mean Little; Barrel Boxers in Action

BOXERS BATTLE IN BARRELS FOR NEW RING THRILLS

Wearing barrels suspended from their shoulders, boxers at the Oregon agricultural college furnished spectators amusement by their grotesque tactics. The "protectors" eliminated such difficulties as hitting below the belt and tested the ability to attack and protect the head.

AIR MOSS REALLY AN ANIMAL ALTHOUGH SOLD AS PLANT

Among the interesting specimens in nature are those that lie close to the borderline between plants and animals, sometimes confusing scientists and almost always a riddle to the layman. One of these is the air moss, which is dredged up from the sea, dyed a brilliant green and sold in conveniently sized bunches. The material is not vegetable but animal, being built up by the secretions of a vast number of minute creatures living in a close and harmonious colony. Each animal has long tentacles to sweep food into its mouth. The colonies grow at moderate depths.

"CAFETERIA" HOTEL HAS NO CLERKS OR BELL BOYS

You write your name on a blackboard, go to your room, where you find the key on the inside of the door, and next morning, you slip a dollar in a slotted box at the entrance, as you leave. These are the chief formalities at a Texas hotel which is run strictly on the self-service idea, without clerks or bell boys. Each room is supplied with abundant stocks of linen and other necessary articles, and the proprietor asserts that he has had few patrons who have attempted to evade payment. The hotel has proved especially popular among auto tourists.

OLD ROOSEVELT FAMILY HOUSE RETURNS TO FAMILY

Still in good repair, a wooden house at Brooklyn, Conn., built by Col. Daniel Tyler, great-great-grandfather of Mrs. Theodore Roosevelt, has been purchased recently so that the Roosevelt family may retain possession of it. The dwelling was built in 1765. A tomb and statue near it were erected in memory of Gen. Israel Putnam, revolutionary-war hero.

Tyler House in Brooklyn, Conn., Built in 1765, and Recently Acquired by the Roosevelt Family

Atlantic Air Liner Designed by M. Louis Bleriot, First Man to Fly across the English Channel; He Provides Four Engines and a Detachable Fuselage Built like a Boat

TWENTY people, including two women, missing and presumably drowned at sea; seven lives snuffed out in preparing for long-distance flights. That is the toll of aviation's biggest, most spectacular year in all the twenty-four years since Orville Wright took the first plane into the air at Kitty Hawk, N. C., on December 17, 1903. And the whole world is asking whether transoceanic flying is worth the price in lives and material.

The answer is important, for throughout the world well-meaning people are initiating movements to put a stop to such flying. Whether such a ban would work is doubtful, but three of the eight men who succeeded in crossing the Atlantic this year have declared their opposition to it. Col. Lindbergh says it would put a stop to scientific progress; Clarence Chamberlin declares it would retard the advance of aviation, and Commander Byrd believes the step unnecessary because the pressure of public opinion alone will deter further needless risks by eliminating possible financial backers.

No one can say whether the lives sacrificed will be paid for by the lessons taught, but it is probable that the benefit to aviation of the failures will be equally great as the benefits of the successes. Lindbergh showed the Atlantic could be crossed by an airplane. Chamberlin showed it was possible to cross it and carry a passenger. Byrd demonstrated that a multimotored plane could not only make the crossing but carry four men, the last word in scientific navigating equipment and a complete radio installation to keep in touch with the rest of the world all the way.

And the failures that followed showed that once those facts had been proved it was foolish to keep on attempting the feat with single-motored ships, without radio and navigating equipment, and with airplanes incapable not only of landing on the sea, but of remaining afloat in moderately rough weather.

In the final analysis it is probable that the lessons of failure will do more to speed up the building of the right kind of planes for long-distance flying than all

Major Coli, Left, and Captain Nungesser in Their "White Bird," Decorated with Nungesser's Grim Wartime Insignia

the enthusiasm aroused by the successful flights. The automobile has been built on the lessons of its own faults when driven to destruction, and the same is true of every other piece of machinery that has reached a high state of evolution. So it is reasonable to assume that the lessons of disaster may, in the end, outweigh the rewards of success, and in that sense even the heavy toll of life be made to pay.

Aviation leaders are generally agreed on a number of the lessons learned, including:

Abolishing the use of land planes for long flights over water.

The necessity for multimotored planes, capable of carrying on with at least half their engines out of commission.

Complete radio-sending and receiving equipment for every long-distance flyer, with a competent radio operator in charge.

Improvement of both navigation and flying instruments, and competent aerial navigation for every long flight.

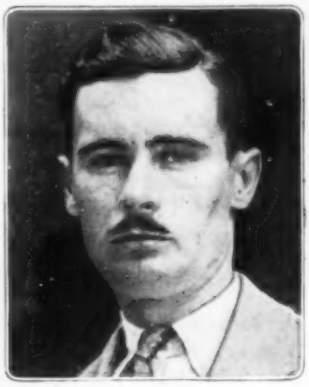
Better weather reports covering conditions along the sea routes.

Charles A. Levine, of New York, who hopped bareheaded into Chamberlin's plane and flew to Europe as the first transatlantic aerial passenger, is planning a regular Atlantic air service. Announcing the details in London, he said he planned to build ten planes, each with a capacity of fifty passengers, besides its crew. Each plane would have seven engines, of which only four would be in use at any one time, leaving three in reserve. The ships would be monoplane flying boats, capable of landing at sea, if necessary.

Their great size, with fifty passenger seats and berths, would mean economical operation. With a ship like the one he flew to Europe, the fare would have had to be at least $2,500 per passenger, whereas his proposed seven-motored airplane would bring the overhead down, by dividing it among so many people, to the point where aerial liners could compete on favorable terms with ocean steamers.

Levine isn't alone in planning mammoth air liners. Prof. Junkers, Rumpler and other German designers are already building them, and Louis Bleriot, the first successful sea flyer in history, for he crossed the English channel, has prepared designs for two. Both are monoplanes, each driven by four engines, placed in tandem fashion, two on either side of the fuselage, driving a pulling and pushing propeller. One of the designs calls for 2,800 horsepower. The passengers would be housed in

Part of the Long Honor Roll of the Brave; at the Left Is Lieut. Col. Minchin, Famous British Airways Pilot, Who Was Lost with Princess Lowenstein-Wertheim When Her Plane, the "St. Raphael," Disappeared in the Atlantic; at the Right Is Capt. William P. Erwin, Who Went to Sea on a Rescue Mission in His "Dallas Spirit" and Fell in a Tailspin Somewhere West of San Francisco, as His Radio Reported Before the Ship Hit the Sea



Ike Eichwaldt, Navigator of the "Dallas Spirit," at Left, Sent the Final Radio S.O.S. That Told the World Their Rescue Mission Had Failed; in the Center Are J. D. Hill, Left, and Phillip Payne, Right, Respectively One of the Pilots and the Passenger in the "Old Glory"; Hill Sent the Radio S.O.S. Just Before They Fell; at the Right Is Paul Redfern, of Georgia, Who Circled a Freighter Off South America and Then Disappeared into the Blue

Lloyd Bertaud, the Pilot Who Took "Old Glory" on Her Last Flight, at Left; He Learned to Fly More Than Twenty Years Ago by Building a Glider from Popular Mechanics Plans; the Smiling Pair Are Gordon Scott and Jack Frost, Navigator and Pilot of the "Golden Eagle," One of the Two Planes Lost in the Dole Flight, and for Whom the "Dallas Spirit" Was Searching When She, Too, Sent Her S.O.S. and Plunged into the Pacific Ocean

be enormous harbors to shelter seaplanes, have vast landing decks for land ships, and provide hangars, machine shops, mechanics, and hotels for the passengers. Their cost would run into the millions.

It is possible that a half dozen stanch lightships, anchored at similar intervals, and equipped with powerful radio to report weather conditions hour by hour, might be more useful, at less cost.

There is a growing field for aerial navigators capable of guiding a plane to any part of the world. They must know more than the captain of a surface ship, for the latter's field is limited to the surface of the sea and the storm winds immediately above it. The air pilot, on the other hand, must be not only a competent navigator by sun and stars, but must be an expert meteorologist, versed in the air layers for miles above the earth, and capable of finding the most favorable layer in which to fly his course.

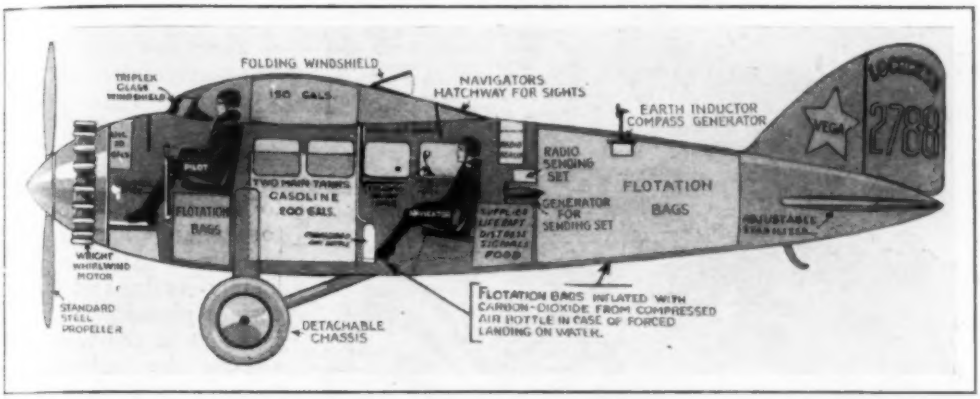
John Pedlar, Miss Mildred Doran and Lieut. V. R. Knope, of the "Miss Doran" Plane, and Capt. Tulley and Lieut. Medcalf, of the "Sir John Carling"

the wings as well as in the central body. The other ship, a smaller model, would have four engines developing a total of 900 horsepower—motors the same size as the ones Lindbergh, Chamberlin and Byrd used—and the fuselage would be a detachable lifeboat, capable of being released from the wing and driven over the waves under its own power.

Equally important with bigger and better ships, powered with several engines and fitted with boat hulls, is the need for better weather service. The shortest air routes do not follow the usual steamer routes at sea, for the latter are diverted by the necessity of keeping away from land and other obstructions. Yet the only sea-weather reports available are those wirelessed by ships. They are supplemented, in part, by predictions based on the known speed of storms checked while they moved across land, but, at best, predictions for weather over the sea remain inadequate.

Several inventors have proposed huge landing stages, to be anchored at intervals of 500 miles across the ocean. They would

Better navigators and better weather reports are essential before round-trip flights to and from Europe become practical. The westbound trip has never been made by a heavier-than-air machine, and only twice by gas-filled ships. The first was the British "R-34," which made the



The Type of Ship Used on Most of the Ocean Flights This Year, Big Monoplanes, Single-Engined, Equipped with Some Provision for Floating on the Water; This Is the "Golden Eagle"

round trip to the United States just after the war, and the second was the German-built airship "Los Angeles," which was flown from Germany by a Zeppelin crew and delivered to the U. S. navy.

Two French, two German, one English and one Irish plane have started the westward trip. Nungesser and Coli disappeared at sea, and all the rest turned back safely when they found the weather out over the Atlantic was worse than the weather reports had led them to expect.

The westward flight is not going to be accomplished, nor is a regular air line going to be established, without taking more chances. If the attempts are made in haste, without proper preparation and equipment, in order to win a prize donated by some well-meaning person anxious to have his name connected with aviation and the tremendous amount of publicity such a connection brings, it may end in failure and further loss of life.

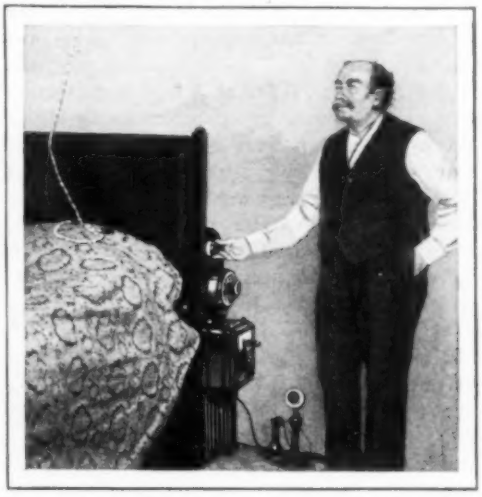
To aviators, however, that loss is considered part of the game, which is why they resent any suggestion of forbidding hazardous flights. They point out that when Orville Wright made his first flight at Kitty Hawk he took chances far beyond those faced by any ocean flyer. He didn't know how to fly, nor did he know that his ship would fly, and the ocean racers knew the answer to both. His homemade engine was so weak it could barely keep the ship in the air at thirty-five to forty miles an hour, and every flyer knows that safety lies in speed, for the slow, lumbering plane is at the mercy of every air gust and every air pocket.

A regulation against hazardous flying would have kept Wright, Santos Dumont, Bleriot, Glenn Curtiss, and all the rest of the pioneers out of the air.

If aviation profits by the lessons of disaster, as it is preparing to profit, then it may be said that the price, however great, was not too much.

BED ROCKED TO IMITATE TRAIN AS INSOMNIA CURE

Discovering that he could sleep much better in moving trains than in a stationary bed, Sir Alfred Yarrow, a British marine engineer, devised a rocking apparatus for his bed to reproduce the motions of a sleeper berth. It is operated by electricity and controlled by a button.



To Imitate the Rocking of a Train; Electric Shaking Apparatus Connected to Bed, to Induce Slumber

Testing Gas Masks in the Experiment Chamber; the Men Are Breathing Fumes from Inner Compartment While Attendant Keeps Careful Watch and Checks the Time

GAS-MASK TESTERS RISK LIVES TO PREVENT ACCIDENTS

To make sure that gas masks issued for service are in working order, they are tested under conditions somewhat perilous to the demonstrators at a London laboratory. Men wearing the masks breathe fumes from a poison chamber, while an observer carefully watches them for signs of trouble. The air which they exhale is also analyzed to determine the effects of wearing the protectors.

BUILDINGS' COLOR TO SUIT SUN INCREASES CITY'S BEAUTY

Greater attention to color effects in skyscrapers and other buildings is doing much to beautify cities in the opinion of Henry Boehm, New York architect, who points out the importance of studying the quality of the sunlight and the atmosphere in each locality in order to apply the right colors. The reason for this is that what appears to be bright and attractive under an Arizona sun, for instance, may be dull and unsuited to use in a city like Boston, where the air is frequently moist. Color is merely reflected light, certain pigments absorbing part of the rays and allowing others to "bounce back" to the eye. Since the sunlight is affected by the quality of the atmosphere through which it passes, the result is certain to be manifested to some degree on exterior colors especially. Thick, heavy air filters some of the color out of light; hues are intensified in rare air and the angle at which the sunshine strikes an object during different parts of the day, often has an effect on the shade and colors. All these things must be taken into account by the "color architect." The introduction of a wide range of building materials, such as terra cotta in various colors, makes possible a far greater emphasis to the color scheme than builders were able to achieve when ordinary brick, stone and stucco were the principal materials available.

BLACK-BACKED PLAYING CARDS SHOW FEWER STAINS

Playing cards with black backs have been introduced to ease the eyes and to conceal stains. Hearts are in red, clubs green, diamonds white and spades yellow against the black background, the color scheme making it easier to distinguish and sort the cards.

FAT MEN CAN STAND THE HEAT BETTER THAN THIN ONES

Tests by the bureau of mines show that fat men can stand high temperatures better than thin ones. They lost more weight but were less exhausted after the experiments were over. The trials revealed that high pulse rate rather than the mere increase in bodily temperature, is the important factor that brings discomfort under high heat and humidity. In a state of rest and in still air, the experiments revealed that the human body cannot endure indefinitely a temperature higher than ninety degrees Fahrenheit, with 100 per cent relative humidity. Subjects became extremely uncomfortable when the pulse rate reached 135 beats a minute, and unbearable symptoms were manifested at 160. The highest rate recorded was 184.

SPEED OF POCKET-SIZE AUTO EIGHTEEN MILES AN HOUR

One of the smallest motor cars ever constructed was introduced at a recent show in France and attracted considerable attention because of the excellence of its workmanship and its efficiency. It was an exact duplicate of the larger cars, developed a speed of eighteen miles an hour and was just roomy enough for a small child to operate it.

No Bigger Than a Toy, but It Runs like Larger Autos and Carries a Child

Studying a Thunderstorm in the Laboratory; Flashes of Lightning during Discharge Measurements

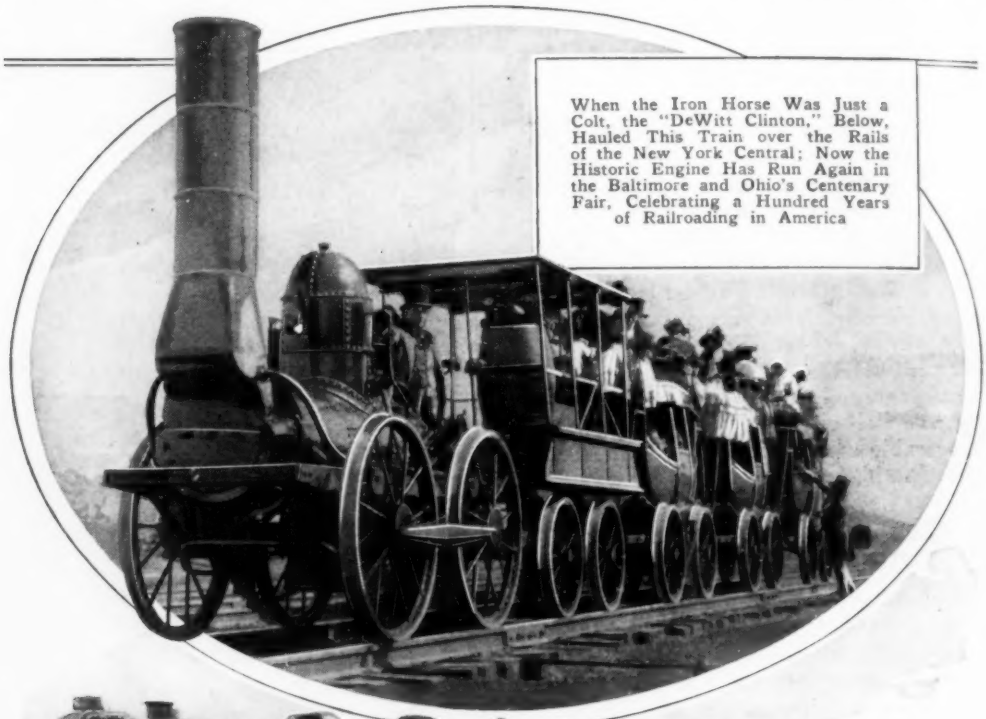
FIRE OF ARTIFICIAL LIGHTNING AIDS STORM STUDY

Reports like those of gun fire and sheets of artificial lightning resembling a miniature conflagration are produced in a laboratory of the General Electric company, in Berlin, where special studies are being conducted on electrical discharges during thunderstorms. A transformer of particular type is one of the important units employed in the investigation.

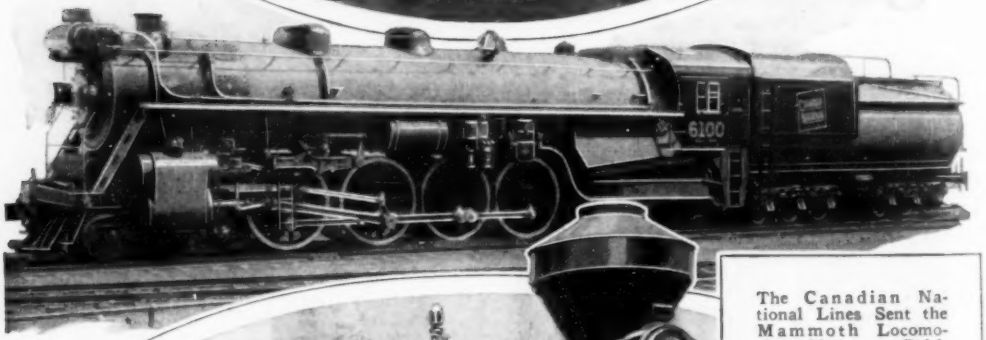
ORIGIN OF BUTTER IS TRACED TO SWAY OF CAMEL

Had it not been for the camel in Arabia, the world might never have discovered butter. The National Dairy council, after considerable research, has traced the origin of butter to the Arabians' habit of carrying sour milk in skin bags across the desert. The swaying motion of their camels caused the contents of the bags to turn to butter, which was first used as a skin lotion. Later, they discovered the trick of making it by tying the bags to fast horses and racing the steeds up and down for several hours. They also laid the sacks of milk on the ground and beat them. With the invention of the first churn, these methods were discarded.

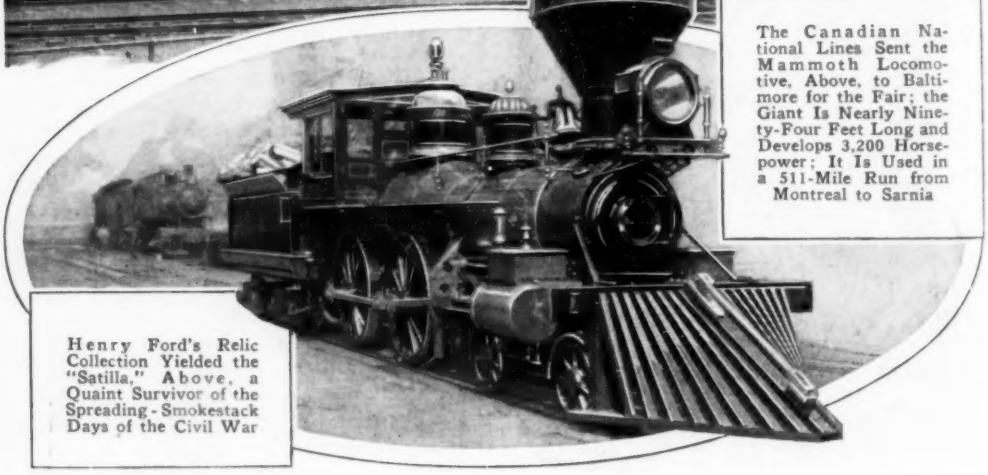
FAIR OF THE IRON HORSE CELEBRATES HUNDRED



When the Iron Horse Was Just a Colt, the "DeWitt Clinton," Below, Hauled This Train over the Rails of the New York Central; Now the Historic Engine Has Run Again in the Baltimore and Ohio's Centenary Fair, Celebrating a Hundred Years of Railroading in America



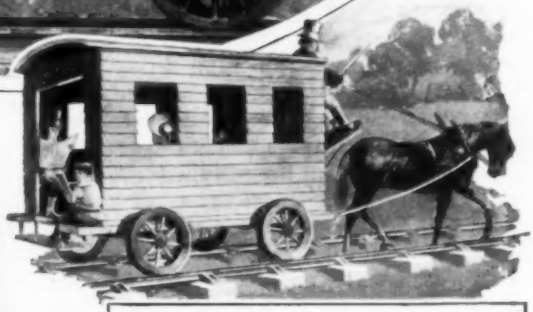
The Canadian National Lines Sent the Mammoth Locomotive, Above, to Baltimore for the Fair; the Giant Is Nearly Ninety-Four Feet Long and Develops 3,200 Horsepower; It Is Used in a 511-Mile Run from Montreal to Sarnia

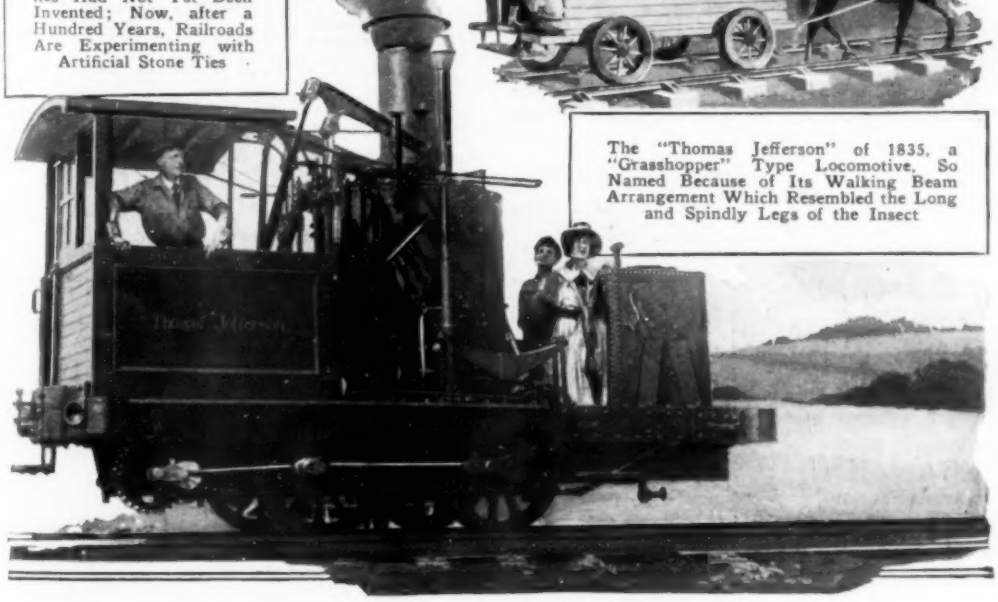


Henry Ford's Relic Collection Yielded the "Satilla," Above, a Quaint Survivor of the Spreading-Smokestack Days of the Civil War

YEARS OF RAILROADING IN THE UNITED STATES

Peter Cooper's Famous Locomotive, "Tom Thumb," Was One of the First Engines to Operate over America's Oldest Railway, Succeeding the One-Horsepower Hay Burner Which Pulled the Original Passenger Coach, Seen at the Right; the First Horsepower Line Is Interesting Because the Rails Were Attached to Stone Bedplates, as Cross-ties Had Not Yet Been Invented; Now, after a Hundred Years, Railroads Are Experimenting with Artificial Stone Ties





The "Thomas Jefferson" of 1835, a "Grasshopper" Type Locomotive, So Named Because of Its Walking Beam Arrangement Which Resembled the Long and Spindly Legs of the Insect

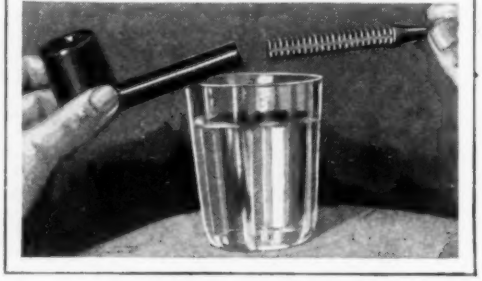
Locomotive as a Traveling Motion-Picture Studio; Photographers and Cameras on Running Board for Realistic Views

CAMERAMEN RIDE ON ENGINE TO FILM RAIL MOVIE

To film realistic railroad scenes for a motion picture, photographers attached their instruments to the running board of a locomotive so that they could get "shots" of their own engine and the track ahead. Special lighting equipment was provided and, although the cameras were securely fastened, the swaying motion was recorded sufficiently to add, in large measure, to the realism of the effect.

AIR AND WATER TOBACCO PIPE GIVES COOL SMOKE

A more enjoyable smoke and greater freedom from injurious substances are two of the advantages claimed for a tobacco pipe now on the market. It has an inner section of disks which is removable for immersion in water to cleanse the smoke.



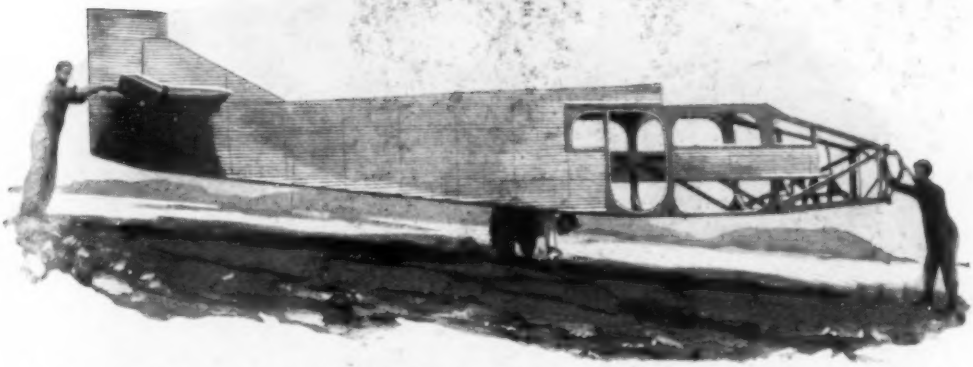
Inner Section of Pipe Removed, to Show the Disks That Hold Water and Help Cleanse the Smoke

WASTE OF ENERGY IN LIGHT SUGGESTS IMPROVEMENTS

Only a small percentage of the electrical energy that flows through the filament in a light bulb, goes to the production of visible light. The rest passes off as heat or rays that cannot be seen by the eye. In some bulbs, as much as ninety-four per cent of the current is unused for actual light, leaving the unit only six per cent efficient so far as illumination is concerned. Improvements are being made, but electric engineers point out that inventors still have a tremendous field in the line that Edison opened up, in producing an electric-light bulb that will give more brilliance without an increase in current or other expense. One expert estimates that if a light only two per cent more efficient than the present common house type could be devised, it would save the country $100,000,000 a year.

DISCOVERIES CHANGE THE MAP OF NORTH AMERICA

A map is a romantic index of adventure which is being changed by recent discoveries. Reports of the Putnam Baffin island expedition, off the coast of Labrador, show a new range of mountains, and evidence that the island was once a part of the mainland. From Africa comes news of the finding of snow fields within fifty miles of the equator, at an altitude of more than 15,000 feet in the Ruwenzori mountains. Natives have feared to approach this range, in the belief that the snows would kill them.



Full Weight of the Fuselage Is Resting on the Man in the Center, the Others Are Merely Balancing the Load; the Plane Body Is Constructed of Light Duralumin

ONE MAN SUPPORTS AIRPLANE THAT CAN CARRY SEVEN

How successfully designers of airplanes have secured light weight without sacrificing the strength of the craft is shown in the accompanying illustration of one man supporting the full weight of a large plane's all-metal fuselage while two others steady it. The material used in this ship was duralumin, which is being developed for increasing use in aircraft because of its light weight and strength. The fuselage is thirty feet long and five feet high, inside, with a capacity of seven passengers.

MERRY-GO-ROUND WASH RACK QUICKLY CLEANS AUTOS

Automobiles, instead of gaudy animal figures, ride a merry-go-round in Los Angeles, but the unit is built for service instead of pleasure. It is a washing rack to save time in cleaning automobiles. Cars are placed on a moving platform and go past the workers, who perform the various operations, thirteen in all, while the owner stands in the center to inspect the cleaning and make suggestions if he desires. The platform is ten feet wide and moves about a circumference of 287 feet. Powerful lights help the cleaners inspect all parts of the car. A machine is cleaned without and within in fifteen minutes.

PUBLIC LIBRARY ON WHEELS SERVES RURAL READERS

Persons living in the country near Cincinnati, Ohio, may enjoy the advantages of a circulating library, for one of the branches of the main department is housed in a specially constructed motor truck, which tours the rural sections, distributing books and collecting those that have been read. Counters on each side of the truck permit inspection of the volumes. An attendant keeps a record of the books that are taken out and returned.

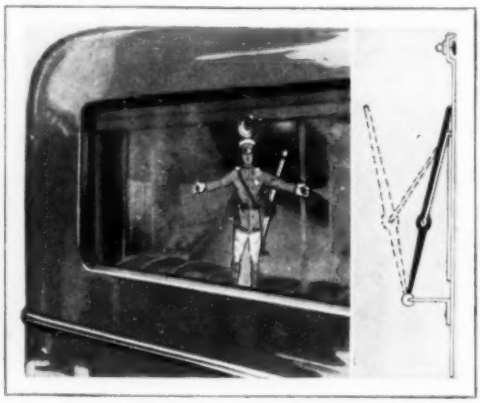
Where the Library Goes to the Readers; the Motor-Truck Reading Room on Location, near Cincinnati

TESTING GIANT OF THE RAILS OVER MOUNTAINS

Testing Apparatus, Installed in Booth on Front of Engine, Enabled Mechanics to Obtain a Complete and Accurate Record of the Locomotive's Performance on Trial Run

Engine "60,000," one of the latest products of the Baldwin works, made a chart of its own movements during a test run over the Sierra Nevada mountains recently. Recording apparatus, installed at the front of the huge locomotive, registered practically every quiver of the monster as it toiled over steep grades and around curves. Besides the engineer and firemen, eleven mechanics were required to help in the test. The locomotive is equipped with an interesting arrangement to prevent sparks setting fire to the wooden snow-sheds. By means of a lever, operated from the cab, the smoke is kept from passing out of the stack in the usual manner and is forced back over the engine and discharged behind so that the sparks cannot strike the roof. The boiler maintains a working pressure of 350 pounds, about 125 pounds higher than the usual engine making mountain runs. No. "60,000" is nearly eighty-seven feet long, its driving wheels are sixty-three inches in diameter, and it weighs 457,500 pounds. The engine is of compound type.

TIN TRAFFIC OFFICER IN AUTO HELPS PREVENT ACCIDENTS



Policeman Figure in Rear of Car, and Drawing to Show How the Arms Are Moved

Attached to the rear window of the automobile with vacuum cups, a miniature tin "traffic policeman" gives a signal when the car is about to slow down. This he does by raising the arms to right angles. The motion of the car causes the action and, when speed has been again attained, the arms fall to the sides.

DUST GENERATES ELECTRICITY

Fine particles of sand and dirt flying through the air during the dust storms common to parts of the west, often generate electric current. Measurements with the aid of a radio antenna wire and spherical electrodes indicated potentials of over 40,000 volts. The tests were made at the Texas technological college, and the investigators, as a result, were inclined to give greater credence to reports that shocks were suffered from radio antennæ during such storms as well as from fence wires and automobiles. The dryness of the air prevents the dissipation of the electricity accumulated. Similar experiments have shown that dust and smoke commonly become charged, a volcanic eruption in Alaska, in 1912, being attended with such continuous thunder and lightning that the natives were terrified. By study of the behavior of dust, scientists believe they may gain further clues as to the weather and so aid aviation and radio communication, as dust is present in greater or less degree all the time practically everywhere.

SPECTACLE BOW ON TOP GIVES WEARER CLEARER VIEW

The bows are near the top of the lenses instead of at the center in an improved spectacle frame introduced by an Ohio oculist. This is said to permit the wearer to turn his eyes to either side without encountering the bows and the frame is rigidly and comfortably adjusted.

TYPEWRITERS TO MATCH DRESS LATEST FASHION FAD

Typewriters in brilliantly lacquered colors have appeared, to match various schemes of interior decoration. The innovation indicates the increasing popularity of the instruments for personal correspondence among women.

"Wrestling" with the Arm and Back Stretcher; This Unit Can Be Adjusted to Give Different Degrees of Resistance

BOUT WITH SILENT WRESTLER DEVELOPS ARMS AND BACK

To take the place of a human antagonist, a western athlete has devised a mechanical wrestler to aid him in his training. It consists principally of two handles or arms, adjusted to a standard, and which are pushed or pulled against resistance that can be regulated to various intensities. The exercise is said to be especially beneficial to arms, shoulders, neck and back.

COAT OF ARMS HONORS ANIMALS IN FIRST BALLOON FLIGHT

According to tradition, a duck, a sheep and a rooster were the first passengers in a balloon ascension in France, more than 140 years ago. Honor has been paid to these pioneer air travelers on the coat of arms recently adopted by an army balloon corps. Figures of the animals are prominently displayed on the shield.

Tracking Down

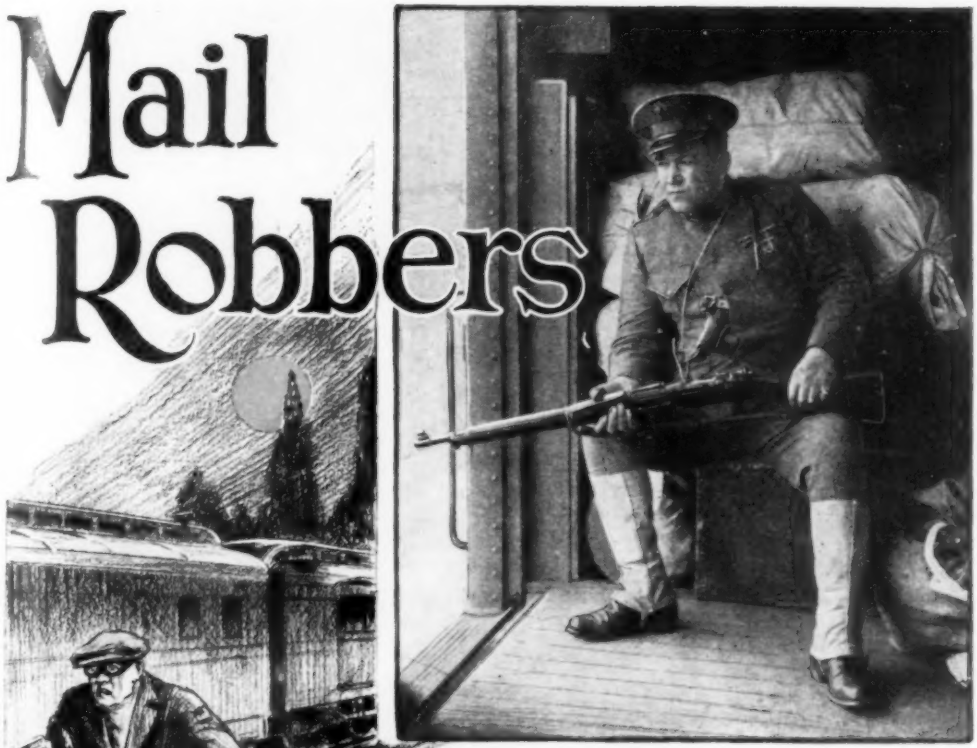
By J. EARLE MILLER

FOUR years ago, three brothers out in Oregon dynamited a mail car, killed four trainmen and escaped, leaving behind a piece of burlap foot covering coated with pitch to throw bloodhounds off the scent. Under the microscope, a criminologist discovered three tiny grains of salt in the burlap, and with that slender thread named the three slayers. More than three years later, one was arrested in the Philippines, where he had joined the army under an assumed name. Three years and eight months after the crime, the other two were caught near Steubenville, Ohio, where one had married and the two were living quietly on a farm. The three confessed and were sentenced for life.

Like the Canadian mounted, the postal inspectors who form the man hunters that guard Uncle Sam's mails, never quit a

The Brutal Murder of Several Trainmen in an Attempted Mail Robbery Has Just Been Avenged by the Capture and Conviction of Three Brothers, Caught by a Scientific Sleuth

Mail Robbers



One of the Marine Mail Guards with Rifle Ready and Pistol Tucked into His Tunic

case until it is closed by arrest and justice, or, in some cases, by the death of the culprit.

The identification of the three d'Autremont brothers as the perpetrators of the attempted mail robbery at Siskiyou, Oreg., on Oct. 11, 1923, is a story that outdoes anything Sherlock Holmes ever dreamed of. Their arrest years later is a story of dogged perseverance and unrelenting chase. Every resource of the government backed the postal inspectors in their long pursuit. Two million pamphlets, with the pictures and descriptions of the three slayers, were printed and spread broadcast. Every post office under the American flag was decorated with posters carrying the pictures and offers of $15,900 in rewards.

C. W. B. Long, postal inspector, who led the chase for more than three and a half years, closed it when he flew by airplane from San Francisco to Steubenville, Ohio, to identify the two brothers arrested there in June. The real story of the capture, however, goes back to a few days after the attempted holdup, when Prof. Edward Oscar Heinrich, of the University of California, found the three grains of salt and built up the chain of evidence that fixed the crime on the three d'Autremonts.

In their flight, one of the brothers lost the burlap foot covering which had been designed to shake off pursuit by bloodhounds. Prof. Heinrich found the three grains of salt adhering to the burlap and put them under his microscope. They were revealed to be grains of a form of rock salt used in salting cattle. A survey of the dynamiting scene, in which the engineer, fireman and a brakeman had been shot down in cold blood and the mail clerk killed in the dynamiting of his car —the blast at the same time destroying

the mail, so that the robbers got nothing —disclosed only one place near by where salting was done. Near it was a cabin, in a grove of Douglas firs. The home-made pitch on the burlap had been extracted, the microscope showed, from the same species of tree.

In the cabin, Prof. Heinrich found a towel on which a razor had been wiped, and, under the microscope, removed from the towel hairs from the beards of three men, along with pieces of skin scraped from their faces while shaving. After examining them carefully, he announced the three men who had used the towel were of French-American descent, blond in complexion, and between eighteen and twenty-five years of age. Further search of the cabin revealed more burlap saturated with the pitch, both material and coating corresponding to that found near the railroad.

Convinced he had found the robbers' hangout, the professor returned to the railroad and, on hands and knees, quartered the ground for 100 yards around. At length, buried under leaves and dead wood in a clump of thorny brush, he found a pair of overalls. In the pockets were other grains of the same type of rock salt, and one pocket still sagged in the shape of a heavy revolver, while another yielded three hairs, evidently scratched from the head of the one-time wearer. The hairs, under the microscope, proved to have come from the head of one of the three who had used the cabin towel after he had shaved himself.

Circling the scene farther, the revolver was found which had bagged down the overall pocket. The gun had evidently fallen into a badger hole while the disguising overalls were being removed. Identification marks on the gun had been filed and burned off with acid, but inside the mechanism, where the owner had for-

The Ruins of the Mail Car Dynamited by the Three d'Autremont Brothers, Showing How an Excess Charge of Explosive Defeated Them by Wrecking the Car and Killing the Messenger

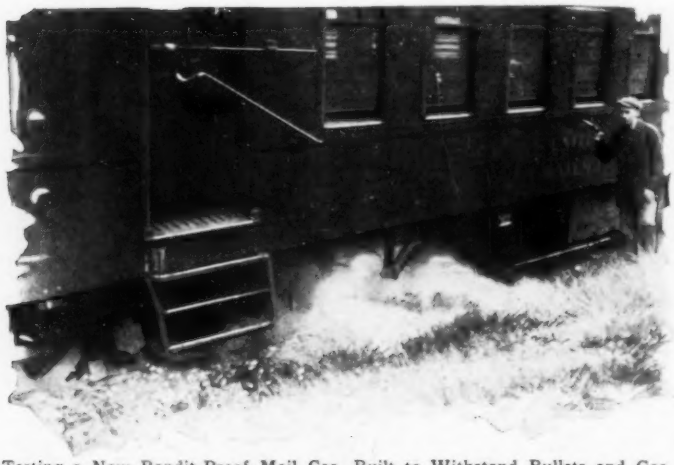
Postmaster-General New and the Commanding Ge eral of the Marines Inspe r the Mail Guard at the Post Office in Washington; at the Right, Prof. E. O. Heinrich in His Laboratory with Microscope That Convicted the d'Autr

gotten to look, was the manufacturer's serial number. Through that the gun was traced to the dealer, and from his records to a man giving the name of William Elliott. The purchaser's description was obtained, and it tallied with the height, length and waist measurements of the overalls. That detailed description fitted one of the three d'Autremonts.

The French-American descent and the blond complexion fitted all three of them. They had disappeared from their usual haunts a week before the robbery attempt, and their father admitted they frequently stayed at the cabin on the range, so the world-wide search for them was actually started within a few days after they had committed the crime and fled from the dynamited train.

The 535 postal inspectors annually solve more than ninety per cent of the cases of mail theft, according to Grant B. Miller, chief of inspectors. Last year, they sent sixty-six men to penitentiaries in major holdup cases, while over 3,000 were apprehended on minor theft charges. In 1926, of fourteen major crimes against the mails, in which $1,408,340 was stolen, the inspectors recovered $760,634. The year 1924 was a high-water mark for mail bandits, their loot totaling $2,509,157, but of this $1,467,444 was recovered.

That was the year of the Rondout robbery a few miles out of Chicago, probably the most daring mail robbery in history, and the largest in point of loot taken. Planned with the connivance of a postal inspector who went wrong—the only case, incidentally on record in which that has happened—the Rondout robbers intro-



Testing a New Bandit-Proof Mail Car, Built to Withstand Bullets and Gas and Well Armed Within

duced the latest thing in bandit technique, forcing the mail-car crew to open the doors by throwing tear-gas bombs through the windows, while the robbers came provided with gas masks to enable them to do their work. They got away with $2,200,000. Eight men were involved, including the postal inspector.

The Rondout holdup was followed by drastic changes in postal routine. Marines were called out to ride the trains and orders were placed for bullet-proof steel mail coaches by hundreds, while the clerks were given increased armament, gas masks to resist tear gas and provided with gas equipment of their own, so the fumes could be released along the sides of the cars. Special portholes turned the cars into serviceable forts.

Under such conditions attacks on mail trains are almost impossible of success, and the major banditries nowadays usually take the form of an attack on a postal truck, or some isolated station just after a factory payroll or a bank shipment has been received.

Miller, who personally has run down sixty-two bandits, sent them to prison for combined terms of more than 2,000 years and recovered from them more than $3,000,000 in loot, participated in unraveling one such crime in 1926 just before he was made chief inspector.

On April 14 of last year, a mail truck, bringing a load of registered mail to the post office in a Chicago suburb, found a touring car blocking the entrance to the rear door. The driver got out, apparently to see why his car wouldn't run, drew a revolver, seized two pouches of registered mail, then ordered the postal

New Type of Mail Truck; the Armed Driver Rides in a Bullet-Proof Cab, Ready to Meet Bandit Guns with a Shower of Lead, While Steel and Bullet-Proof Glass Guard Him

An Assistant Postmaster-General at the Sorting Rack of a Mail Car, with a Marine Marksman and an Armed Postal Clerk, Who Carries a Gun While Distributing the Letters

employe into the touring car and forced him to drive it to Joliet, Ill. The bandit sat in the rear seat and searched the pouches during the drive, extracting $37,000 in cash.

Just outside of Joliet, the bandit's car stalled on a slight incline. Though threatened with death, the mail driver, a boy of nineteen, was unable to make the grade, and even the bandit, who took the wheel, couldn't negotiate it, so he decided to back to a garage and have the clutch fixed. He tried to keep the driver covered with a revolver in his coat pocket while the garage man worked on the car, but the driver succeeded in getting the car between them and ran to a farm house to telephone for the sheriff.

The bandit, becoming nervous, got the two mail pouches, walked out the garage door and disappeared—and then enters the one unsolved mystery of the case. The Joliet police blotter shows the boy reported the robbery at 10:10 in the morning, and at 10:25 a physician in a village twelve miles away reported he had been held up by an armed man who stole his car. Later it was shown the bandit was the auto thief, though how he traveled the twelve miles in not more than fifteen minutes continues to be a mystery, for he refused, when captured, to explain it.

At any rate, a deputy sheriff from the doctor's village started in pursuit, driven by a garage man, and overtook the bandit, who shot him dead, but not before the official had fired one shot through the windshield of the stolen car, the flying glass cutting the bandit's face. A taxicab chauffeur was found later in the day who recalled a passenger bleeding from cuts on the face, and carrying two bags, the first intimation that the mail robber and the sheriff's slayer were one and the same person.

Various clues fixed the bandit's identity, and his home was searched, but it had been abandoned. Confident the man

had not left Chicago, the inspectors arranged with a friendly newspaper reporter to publish an item saying the sheriff had been killed by a foreigner whose body was found near by, and that the post office inspectors believed the foreigner was the mail robber and that he had hidden the loot.

That item inspired the bandit with a false sense of security, and, six days later, the inspectors, who had been following every clue, tracked him down in his room in a Chicago hotel, where he had been living in the belief that no one was looking for him. He got life for the killing and twenty-five years more for the mail robbery, and all the loot, with the exception of $148, was recovered.

TWIN SIDECARS ON MOTORCYCLE CARRY TWO CHILDREN

Room for Most of the Family in This Double-Sidecar Motorcycle; Children Balance the Load and Are Protected by Shields

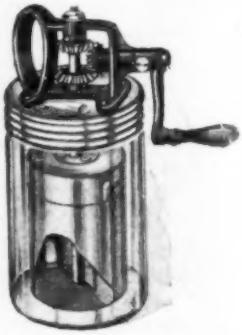
Instead of having a single car on one side, a motorcycle owned by an English rider has a small car on each side, affording individual compartments for his young son and daughter, who often accompany him on his trips.

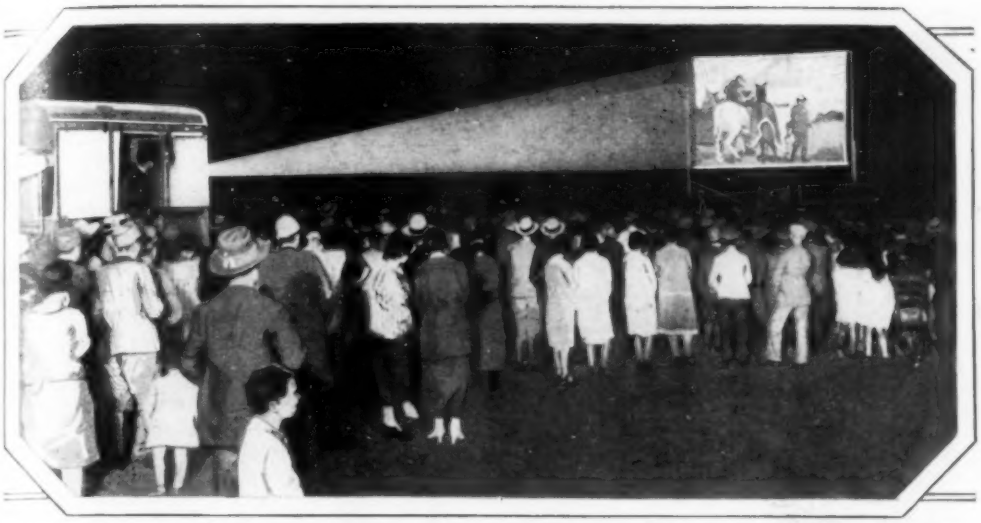
MEASURE BILLIONTH OF INCH TO TEST WIRES

To find out how much wires of different composition expand or contract when magnetized, a scientist of the Bell Telephone company laboratories has developed an apparatus that measures a billionth of an inch. It will also register a millionth of a degree in temperature. It is the most refined measuring apparatus in existence today, surpassing the interferometer, a delicate unit that splits distances into tiny gaps of light waves, by about 100 times in sensitivity to changes in length. When the temperature varies as much as one-thousandth of a degree, a spot of light races across the scale. The instrument was devised for research into the nature of magnetism. No one knows exactly what magnetism is, but it is of prime importance to a telephone company because it plays an essential part in the transmission of sound waves in telephoning. That is the chief reason why permalloy, a special mixture of nickel and iron, became so valuable for cables. It proved extremely sensitive to magnetization and was rapidly put in place of pure iron in loading coils and other devices for transmitting sound. A gauge was wanted to help study the atomic changes which take place in different alloys as they expand or contract under magnetic forces. P. P. Cioffi, a laboratory scientist, was put to work on the problem. In a month, he had devised a plan for the instrument, but many months were required to perfect it.

ICE CREAM FROZEN IN GLASS WITH COLD TABLETS

Patented refrigerating tablets may be used as a substitute for ice in a freezer that quickly prepares small quantities of ice cream with little work. The cream itself is held in an inner aluminum container and agitated with a crank-operated scraper. The outer chamber is of glass for the ice and salt or the special tablets. It is said that the cream can be frozen in about ten minutes





Outdoor Movies in Italy; Projector and Screen Are Carried in Auto Trucks to Remote Towns, and, Besides Giving Entertainment, the Plan Is Helpful in Spreading Propaganda

MOVIE THEATERS ON WHEELS SERVE ITALIAN TOWNS

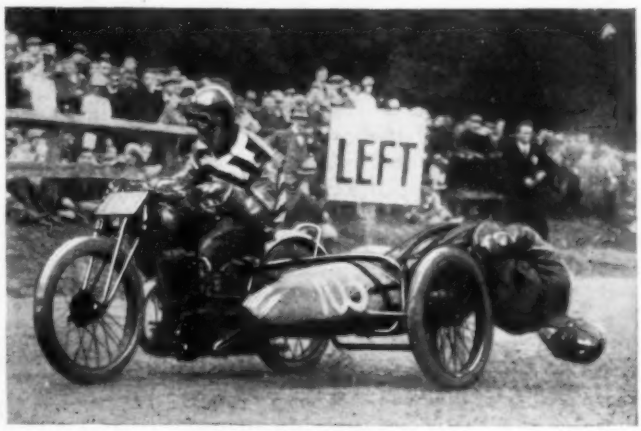
Mussolini is making use of the motion-picture screen in a special way to transmit word to the inhabitants in small Italian towns. Several auto trucks, with projectors and a screen that can be quickly set up outdoors and taken down for packing, constitute a fleet of traveling motion-picture theaters which spread propaganda.

RAILROAD INSIDE ARCTIC CIRCLE HAULS IRON ORE

Threading its way through ice-clad mountains, the Arctic railroad taps a rich deposit of iron ore 150 miles within the Arctic circle, to supply the blast furnaces of Europe with material for the manufacture of special steels. The demand for Sweden's remarkable supply of magnetic iron ore is the reason for the construction of the railway which runs from the Swedish town of Lulea, near the head of the Gulf of Bothnia, to Victoria Havn on the Ofoten Fiord in Norway. Special precautions have been taken to prevent landslides and the fall of avalanches along the road.

HIS CONTORTIONS HELP TO WIN MOTORCYCLE RACE

Credit for winning a motorcycle race in London recently was divided between the driver and the occupant of the sidecar, much of the honor going to the latter. By his clever contortions on curves, he permitted sharper turns than could ordinarily have been made, thereby cutting down time and distance.



Helping to Balance the Racer at a Sharp Turn; the Pilot's Passenger in the Sidecar Prevented Upsets

Honor to a Pioneer Explorer of the Skies, Tycho Brahe, the Danish Astronomer; This Monument Was Recently Unveiled in Sweden

HONOR TO EARLY ASTRONOMER IN MARBLE MONUMENT

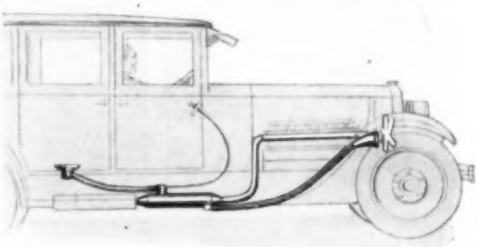
Tribute was paid recently in Sweden to the Danish astronomer, Tycho Brahe, by the erection of a celestial globe of bronze on a white marble base. The monument was unveiled in Helsingborg by Crown Prince Gustav. Brahe lived during the latter half of the sixteenth century, his interest in astronomy being excited by the punctual occurrence of an eclipse of the sun on Aug. 21, 1560, at the predicted time. He regarded the phenomenon as "something divine" and straightway read all he could find on the subject of astronomy and began studies with globe and compasses, although he was supposed to be fitting himself for the law. He gained the support of the king of Denmark in a few years, and is credited with doing a vast amount of valuable work in correcting the errors of earlier observers and computing instrumental inaccuracies.

"BLOODY SWEAT" OF THE HIPPO RED PIGMENT

The "blood-sweating behemoth" of the circus display, does not really sweat blood at all, the red fluid on its skin being an oily substance, excreted when the animal is excited or in pain. The color is due to a peculiar carmine pigment in the skin, which is two inches thick in some places.

HEATER FOR AUTO ELIMINATES THE BACK PRESSURE

Prevention of back pressure on the motor and an abundant supply of fresh, hot air, free from fumes, are cited among the advantages of an automobile heater which utilizes the warmth of the exhaust gases. The system consists of an air-intake pipe, directly behind the fan and in front of the motor, and a series of steel tubes where the air is warmed as it comes in contact with the pipes, heated from the exhaust. The warm current is delivered through a register in the bottom of the car. The only moving part of the installation is a valve to control the fresh air, and the heat is regulated from the dash.



Installation of Heating System for the Auto, Utilizing the Warmth of Exhaust Gases

Coast-Guard Flyer Preparing to Drop the Trailing Gear to Pick Up the Life Line as His Plane Races Out to Sea above the Shore Masts Which Replace the Life-Saving Cannon

Throwing Out Life Lines from Airplanes

New Method of Rescuing Crews of Wrecked Boats Is Adopted by the Coast Guard after Successful Tests

AMPHIBIAN planes, capable of taking off from or alighting on either land or water, are being used at two American coast-guard stations instead of life guns to carry rescue lines to wrecked ships off shore. Developed as the result of five years of experimenting by Lieut. Comm. C. C. Van Paulsen, of the coast guard, the aerial life-saving service is able to establish breeches-buoy connection with ships a mile or more off shore, instead of being limited to a few hundred yards, as is the case with lines thrown by the small harpoon cannon. The record distance for a cannon-shot-carried line is 695 yards, whereas the planes are effective at several times that distance.

The problem of taking a line out to sea by air was complicated by the fact that the plane could not take off while burdened with a trailing rope, so must pick up the life line after it was actually in the air. Comm. Paulsen solved the difficulty by attaching the end of the line to a cross rope swung between two masts placed 200 feet apart. The plane, after getting under way, circles about and passes over and between the two masts, while the observer lowers the weighted end of a light rope, carried on a reel in the airplane. The weighted rope tangles with the line between the masts, jerks it free and carries it out, trailing the life line after it. The airplane flies straight out and over the ship in distress, and the observer then cuts the rope and allows the line to fall across the deck.

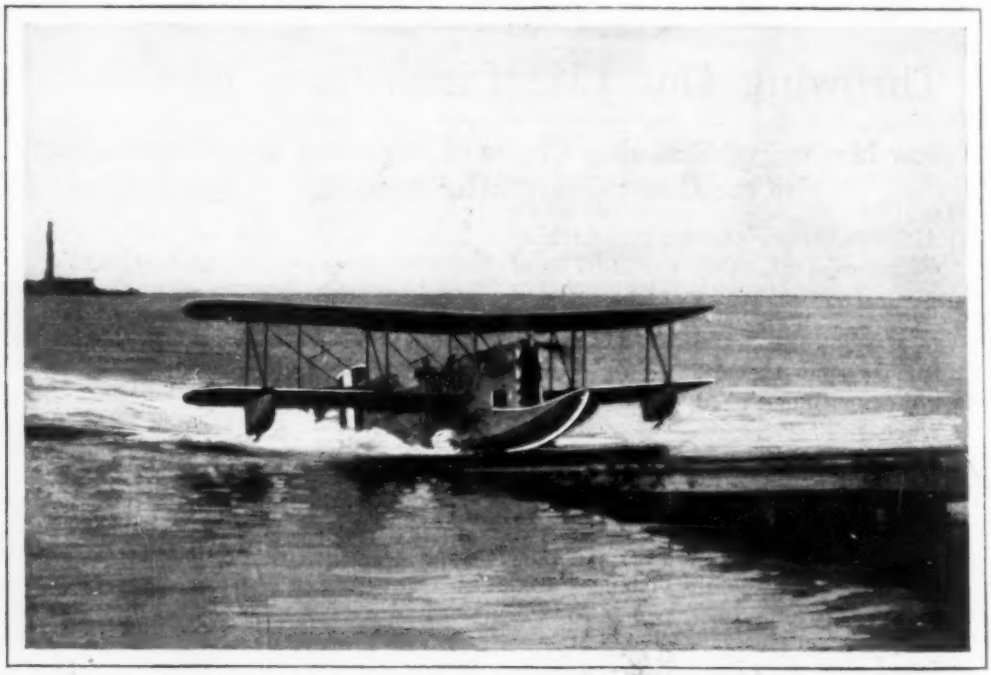
From then on the procedure is the same as in the usual rescue work with breeches-

buoy tackles. The first light line is used to pull a somewhat heavier tackle out to the ship. After it is made fast, the coast-guard crew ashore attaches the still heavier rescue cable and it is hauled out. After the ship's crew has made the end fast, the original light tackle is used to pull the trailing pulley of the breeches buoy back and forth along the big line.

Cape May, N. J., and Gloucester, Mass., are the first two stations to be equipped for aerial life-saving. They were chosen because they had already been provided with Loening amphibian planes, of the type used by Comm. Byrd in Greenland and in the flight around South America. The planes were purchased originally for the aerial patrol against rum ships off Boston, New York and New Jersey shores.

The life line used is so light that the powerful planes can take the end a mile or more to sea before the dragging weight becomes too great. No reels are used for coast-guard lines, as the friction would quickly stop the line, whether fired from a gun or trailed from an airplane. Instead, the line is coiled in a complicated pattern about pegs set in a wooden frame laid out something like a chessboard. The pegs are then withdrawn, leaving the line "faked," as sailors say, in such a way that it will run out without tangling, and without friction.

The Lyle gun, which has saved thousands of lives since its invention by Lieut. David A. Lyle, of the U. S. army, has been the chief reliance of the coast guard for a half century. It is a small bronze cannon, weighing, with its eighteen-pound projectile to which the line is attached, slightly more than 200 pounds. Once the line is made fast to a ship, it can be used either for the breeches buoy, a pair of canvas trousers, knee-length, in which the rescued person is suspended and dragged through the waves, or for a water-tight life car, built like a small submarine and capable of holding a number of people at each trip. The Lyle gun is the successor of one of the oldest forms of rescue apparatus, a powerful crossbow, mounted on a wheeled carriage and bent by turning a crank, which, with an arrangement of cogs and line, brought the bowstring back until it could be caught by the trigger.



Coast-Guard Amphibian Airplane Coming Back to Land and Mounting Its Own Runway; the Planes Are Equipped with Both Boat Hulls and Wheels for Land or Sea

The Life Line Is Attached to a Rope Suspended between Two Masts on Shore, and the Trailing Gear from the Plane, Flying Overhead, Picks It Off and Carries It Out to the Distressed Ship

Coast-Guard Cart and Breeches-Buoy Equipment Being Rigged to a Ship Which Has Gone Aground; the Planes Will Aid Ships beyond the Reach of Life Guns

Home for One of the Oakland, Calif., Fire Companies; the Engines Are Housed in Garage Space in Basement

FIRE STATION LIKE RESIDENCE BEAUTIFIES CITY

The city of Oakland, Calif., has introduced a different style in fire stations. Instead of the usual garagelike structure, its latest unit is patterned after the plan of a residence, with space for the engines in the first story and men's living quarters above. It is made of brick and concrete.

RADIO-EQUIPPED ARMY TANKS DIRECT MANEUVERS

An army of "robots," mechanical monsters carrying gas-masked men, was mobilized recently when the British army held five weeks' maneuvers for the mechanical force, which corresponds to the American tank corps. Little two-passenger tanks, mounting a driver and a machine gunner behind steel breastworks, sped across the fields on endless treads, or switched in a twinkling to rubber-tired wheels and dashed down clear roads. Four-passenger tanks, with guns in conning towers, huge battle tanks mounting small field artillery, heavy anti-craft guns on tractor mounts, and tanks equipped with wireless rumbled after them. Overhead attack and pursuit airplanes soared and dipped while they sprayed the advancing steel army with bursts of machine-gun fire. The maneuvers continued day and night under conditions as nearly like those of actual war as could be produced on Salisbury Plain.

"The roar of the great engines used in the tanks and tractors, the sharp crackle of machine-gun fire, and the crashing of eighteen-pounder quick-firers were nerve-racking," said one of the correspondents who covered the maneuvers. "The army on wheels traversed a rugged country in the robot maneuvers.

"The engagement was like an evil dream, with mythical gray monsters spitting flames and death. Noise, smoke and unceasing clatter lasted nearly an hour while deadly single-seater fighting planes swept the crews of tanks and motor cars with accurate fire.

"'Road bombed out of existence,' was

Radio-Equipped Tank Used to Direct Battle Operations in British Maneuvers of the Mechanical Army

the message flashed back from the wireless scouts. 'Make your own way across country,' came the command.

"Then the mechanical army moved, the sluggard pace quickened; one-man tanks bustled hurriedly over the banks on the side of the road on their scouting duty. The 'dragons,' with their wheels within wheels, scuffled at dangerous angles into the open country, the crews clinging perilously to their seats. Heavily armored beasts, on tracks, wallowed lustily through ditch, over bank, and among brushwood. The land liners—the eighteen-pounder quick-firer guns on self-propelled mountings—swept into position, the gun crews jumping to stations.

"Suddenly three airplanes, like falcons, dropped out of the bank of leaden clouds. It was a startling moment. The unprotected vehicles out in the open field, balancing precariously as their speed increased, hurried for the shelter of the trees. Men in the dragons opened fire with their rifles as the falcons swooped down."

FOLDING COVER ON TYPEWRITER PROLONGS MACHINE'S LIFE

To keep dust and dirt from the intricate parts of the typewriter, a collapsible cover now on the market locks securely when in place, fits down over the machine like a bellows, and is easy to open or close. It is proof against dust, is permanently attached to the machine and is equipped with an adjustable copy holder.

TILT STOPS GLASS REFLECTION IN BUS WINDSHIELD

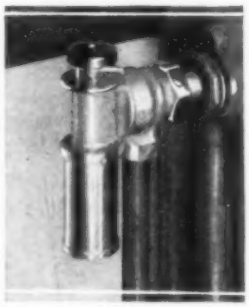
By tilting the windshield of the motor-bus forward from bottom to top and painting the ceiling over the driver's seat black, an eastern company has found an effective way to eliminate reflection from the lights inside. The plan is said to contribute to the safety of night driving.

Anita Loos, Testing the Color of Helene Millard's Hair with the Shade Chart

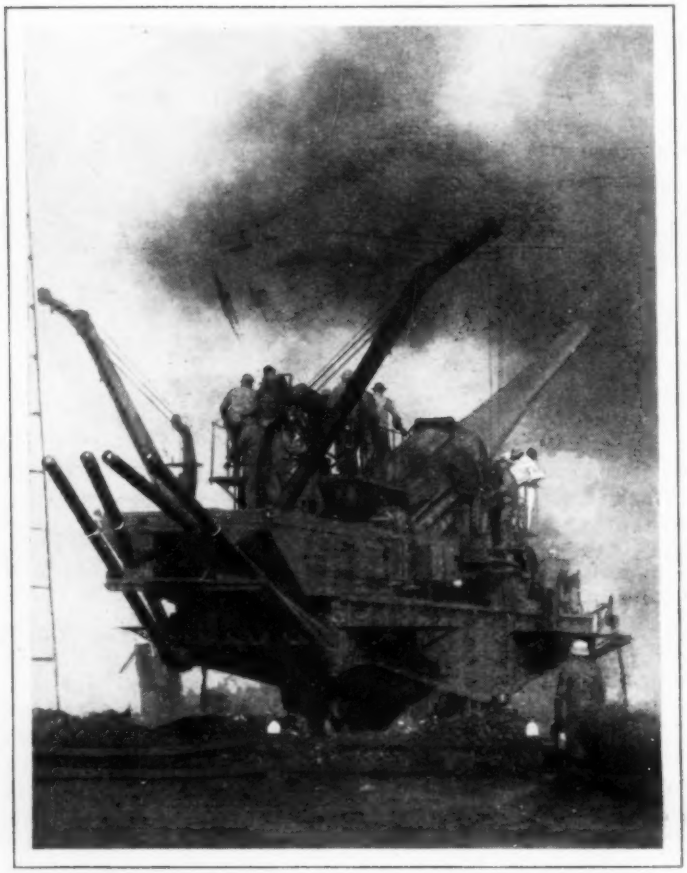
HAIR TESTS WITH COLOR CHART TO IMPROVE MOVIES

The actress for the motion-picture part may be beautiful and "screen well," but is her hair the proper color? The question is a very important one in the minds of the moving-picture photographers, and to answer it, a special color-testing chart has been devised. The candidate's hair is quickly and easily compared with the samples on the card, all of which have been photographed to determine their values in the finished picture. In this particular case, the performer's hair had to be as light or lighter than color No. 5 on the chart.

AUTOMATIC VALVE ON RADIATOR REGULATES TEMPERATURE



Direct control of room temperature is said to be afforded through a thermostatic valve attached to the radiator. It requires no power or special piping as it is self-contained, and there are no difficulties due to leaks, lodgment of dirt or other troubles, the manufacturers claim. The temperature may be varied.



Big Coast-Defense Rifle in Action during Marksmanship Test; the Gun Is Mounted on Railway Carriage for Easy Transportation

SHOOTING TWENTY-SEVEN MILES TESTS COAST GUN

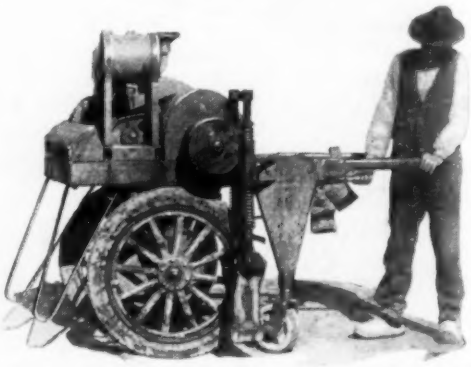
Marksmen were given an opportunity to test their skill recently when the giant coast-defense rifle at Fort MacArthur, Calif., was given its first service firing. This huge piece, mounted on a railway carriage, so that it can be transported to points of vantage quickly, has an effective range of over twenty-seven miles.

RADIO IS WEAKENED BY LIGHT SHINING ON AERIAL

Operators of radio station WLWL, in New York city, were mystified not long ago to discover that the signals perceptibly weakened and then grew stronger during the broadcast. Examination showed that a powerful searchlight was being played from a statue near by and, in its path, swept across the station's antenna. Whenever this occurred, the signals grew weaker. The phenomenon is in harmony with the fact that radio reception is usually better at night than during the day, for light rays and radio waves, apparently "clash" in some mysterious way to the disadvantage of the latter. It has been suggested that the bright illumination in the cities near radio broadcasting stations is one reason why better reception at distant points is not accomplished. A weak searchlight probably would have no appreciable effect, however.

PAVING BLOCKS LAID WITH MOTOR

In laying street paving blocks in Denmark, a motor-driven pounder has been employed with success. It is said to do the work of several men at a saving of time and expense and also performs the task more thoroughly. The outfit is somewhat like a small pile driver and the force of the blows can be easily regulated.



Placing Paving Blocks with the Portable Pounding Outfit Operated by a Motor

WATER-SOAKED LOGS SALVAGED FOR LUMBER PROFITS

Minnesota lumbermen are realizing profits from the wasteful methods of their predecessors, in salvaging logs which long have been under the waters of woodland lakes in the old timber districts. Millions of eighteen and twenty-foot cuts, entire rafts and other timbers in an excellent state of preservation, have been pulled from the lakes with big cranes and cut into boards. Much of the wood is of superior quality and it does not warp like green timber. More than 3,500,000 feet of lumber was taken from one lake last year and like quantities from others. Removal of the logs is also an aid to users of canoes and motor boats.

SELF-CHALKING PLUMB LINE SAVES WORKER TIME

For carpenters, contractors, masons and others who use a chalk line, a self-chalking cord on a reel that fits into the pocket, saves time and trouble. There is a chamber at the top which is filled with powdered chalk and a patented device prevents the contents from spilling. The reel is quickly wound or unwound, keeps the line from tangling and knotting, and can be folded out of the way.

GLASS FUSE PLUG DISCOLORS WHEN IT BLOWS OUT

Detecting blown fuse plugs of the usual type is not always easy, but can be done at a glance with a glass plug recently introduced, the manufacturers claim, as it discolors at an overload or short circuit. The effect can be seen in the center of the top of the plug, and the unit is installed in practically the same manner as it is in the ordinary ones.

Did Aztec Children Play with Toy Soldiers? This Figure, from Burial Mound, Indicates That They Did

TOY SOLDIER CENTURIES OLD FOUND IN BURIAL MOUND

Interesting pottery images, believed to antedate the days of the Aztecs, were uncovered from a burial mound in Mexico recently. Among them was a figure of a warrior, indicating that toy soldiers may have been popular even then. Small statues of dogs were also found.

GOLF-BALL BRANDING STAMP AIDS IDENTIFICATION

Golf balls are quickly identified with the owner's initials in indelible ink by the use of a marking stamp specially adapted to fit the contour of the sphere and to hold the letters so that they cannot slip out. The outfit includes the stamp, pads and a supply of ink.

Trailer and Sidecar Fit This Motorcycle for Carrying the Camping Party and Equipment

CAMP TRAILER ON MOTORCYCLE CUTS OUTING COSTS

Vacation and its camping trip at less cost was the object of an English motorcyclist who rigged a trailer for his cycle. An advantage of the outfit was that it could be taken to places difficult to reach by automobile so that more secluded camping spots could be enjoyed, time saved and expenses reduced.

SLOT MACHINE CANCELS LETTER ELIMINATING STAMPS

Use of a cancel permit for letters as a substitute for stamps is made available to the public in a slot machine introduced in England. The envelope or card is placed in a slot, a coin inserted in another and the mark is stamped on by turning a handle. After the envelope is canceled, it passes into a compartment where it is later collected by the postman.

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Slot Machine That Cancels Letters, Saving the Use of Stamps; It also Serves as Mail Box

FLOATING SERVICE STATIONS FOR LINERS

Fifty miles outside the Golden Gate, a trans-Pacific liner rolled, power in her engines only sufficient to hold her head to the seas. Her wireless crackled the story of her battle with winds and waves, telling in dots and dashes that her tanks were drained until she had not enough fuel to reach San Francisco. Five hours later, what seemed a submarine riding on the surface, noiseless as a floating shadow, swung in a wide circle until she lay alongside the pitching steamer. A great hose was lifted, passed inboard, and a hum as of a swarm of giant bumblebees arose from the small boat. In half an hour, the submarine had become a monitor, rising as she poured her own contents into the liner's tanks, showing herself for what she is—a floating service station for deep-water steamships. The general idea of a tanker is that of a huge, sluggish vessel, stored with thousands of barrels of oil, bound on long voyages. But up and down the Pacific coast, the oil-refining corporations have devised toy tankers, small craft, few of them more than 150 feet long, many of them much less, carrying from 1,000 to 2,500 barrels of crude oil, devoted to the servicing of ships. They also force their streams of liquid fuel over thousands of feet of land lines, supplying gas-manufacturing establishments, truck tanks, for road builders, factories where oil is burned under steam boilers, and, in times of storm on the bays and harbors, flooding the waters with oil, so that other and larger ships may make their berths of protected anchorages in perfect safety.

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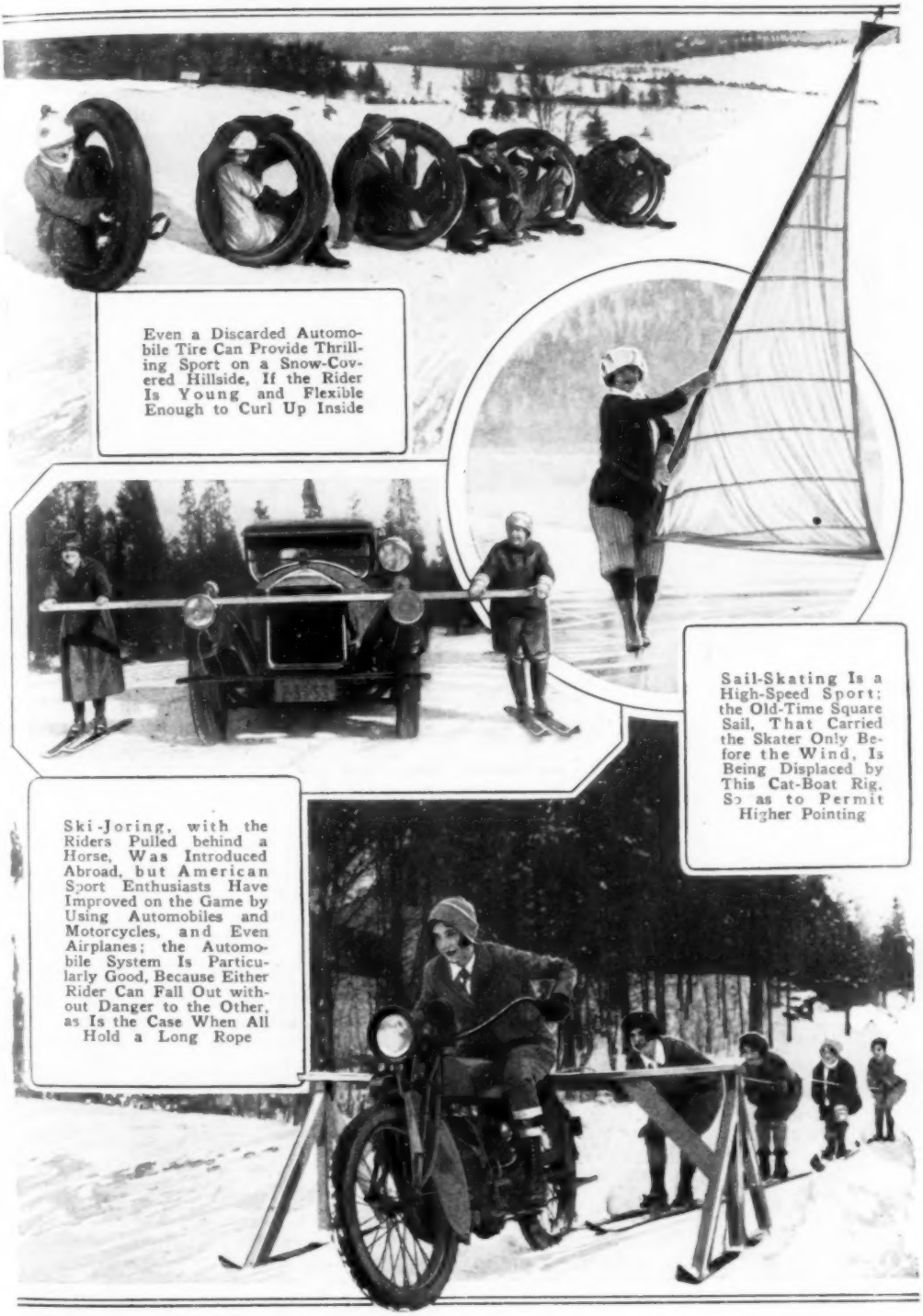
PUTTING ZIP AND SPEED INTO WINTER SPORTS



Even a Discarded Automobile Tire Can Provide Thrilling Sport on a Snow-Covered Hillside, If the Rider Is Young and Flexible Enough to Curl Up Inside

Sail-Skating Is a High-Speed Sport; the Old-Time Square Sail, That Carried the Skater Only Before the Wind, Is Being Displaced by This Cat-Boat Rig, So as to Permit Higher Pointing

Ski-Joring, with the Riders Pulled behind a Horse, Was Introduced Abroad, but American Sport Enthusiasts Have Improved on the Game by Using Automobiles and Motorcycles, and Even Airplanes; the Automobile System Is Particularly Good, Because Either Rider Can Fall Out without Danger to the Other, as Is the Case When All Hold a Long Rope

THE

Earl Sande, America's Premier Jockey, Wearing the Floral Horseshoe after a Victory on "Sarazen"

By A. A. ALBELLI

"THE chief thing about winning a race," declares Earl Sande, America's highest-paid jockey, "is to know your horse. I don't mean being acquainted with the horse, but knowing it—knowing its disposition and its temperament. Horses are as temperamental as prima donnas. You and the horse have got to be buddies."

"Taking it for granted that you know your horse well, how do you manage to push him out in front during a race?" he was asked.

"The best way I can explain that," he replied, "is to take the first day of the races here this season when I won the Saratoga handicap with 'Mars,' son of 'Man o' War.' 'Mars' is just like the rest of his kind, a fine mount. That was one of my typical races. I got my good start. I left it to somebody else to be the pace maker. But the good start is very important. Ground lost at the start is hard to make up. I made it my business to get the measure of the field as soon as we made the first turn. Then I eased off a bit to give 'Mars' a breather and, when I was ready to spurt through, the colt was right with me.

"The thrill of shooting down the homestretch past 'Black Maria,' to beat that filly by a length and a half, was one I shall never forget."

"In that particular race, Mr. Sande, who was it that won, you or the horse? Is the race between the jockeys or the horses?"

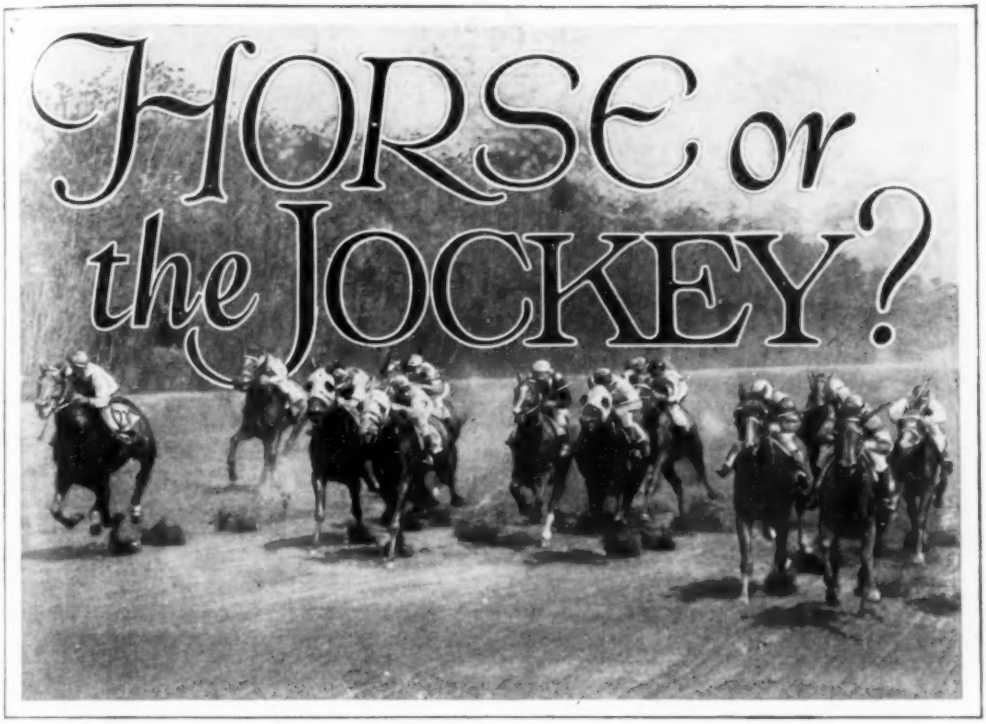
"It's both," he responded. "It is that combination I was telling you about which is struck up when the jockey gets on good terms with the horse. Then the two of you are made one. The one cannot win without the other."

"I think you are known to be a hand rider, Mr. Sande."

"You bet. That's just what I want to be known as. I never use a whip on a horse. I don't believe in it. Horses slow up and swerve when whipped. I have seen many instances where jockeys have lost races they might have won if they hadn't resorted to the whip.

"Race horses are almost human in that respect. You are their friend. They resent it very much when you welt them with a whip. Sometimes I think their feelings are hurt. Instead, I kind of like to jolly a horse along.

"That is something few riders can do. I think I have developed the knack to perfection. I actually talk to my horses. I give them baby talk. At the same time I



Fourteen Youngsters Thundering down the Track in a Race for Three-Year-Olds at Belmont; the Picture Was Taken 150 Yards from the Start, with the Field Still Bunched

paw them with my hands, sort of slap them gently to spur them on. But I never lose my head and abuse them. Horses are honest, usually, and they'll always give you the best that's in them if you only treat them right.

"'Mad Hatter,' which I rode in 1924, used to be a good one for that. This riding racket requires masterful strategy. No two races are the same, no two horses are the same. I used to have 'Mad Hatter' so trained that he knew when the cue came to overhaul the bunch. We'd be riding a little behind two leaders, then all of a sudden I would crouch over and barely whisper to 'Mad Hatter.'

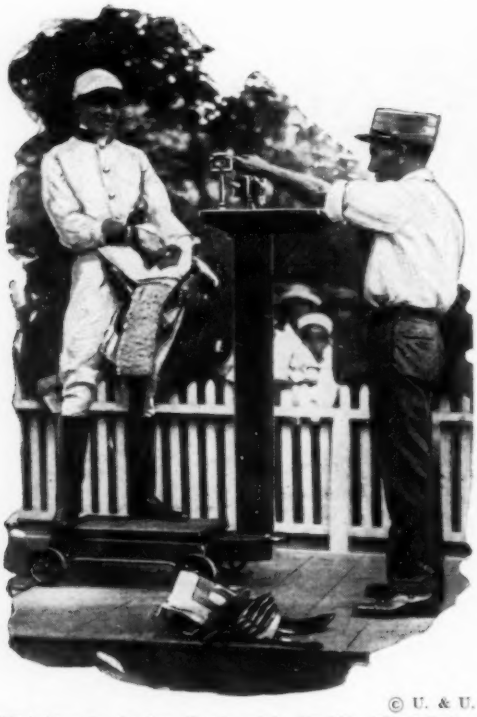
"I used to say, 'Whoa boy! Easy now! We're winning,' and sort of pet him. I would keep a light pull and keep talking to him, then suddenly I'd jerk and give him free rein and he was off like a bullet."

"Is the horse aware of the fact that he is running a race?"

"If I can help it, I keep my horse from being race-conscious. I don't let him notice the pace. Naturally a horse does not know he is running for a rich purse, though he is usually aware of the glory that awaits a victory.

"Then, when the horse finds that the track ahead of him is cluttered up with other horses, he just naturally lets out and runs around them. But that doesn't always work. There are different types and different temperaments. The nip-and-tuck variety of race, with quick thinking on the part of the rider, is the most common. The rider has got to be keen and ready to take advantage of any opening. Being on the alert and grabbing off the chances when they loom, is one of the strong points.

"For instance, I have been credited with an uncanny knack of starting a winning drive with a stolen length or two before my rivals realize that I have thrown myself heart and soul into the race. I always try very hard to win every race. I think that my self-confidence—untainted by vanity, mind you—together with my experience in riding most often carry me through to victory."



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Weighing in Jockey Sande with All His "Tack," Including Saddle and Lead Weights

"Is there any money for the jockey in the horse-race business?"

"A good jockey will always find fair compensation. At the present time I am not under exclusive contract to anyone. Joseph E. Widener, the Philadelphia millionaire, has first call on me to ride his horses. He pays me $15,000 a year for that privilege. Otherwise I am entirely a free lance.

"Take that Saratoga handicap. 'Mars' was owned by Walter M. Jeffords. The purse was $8,000, of which I received $1,000. The rate is usually ten per cent of the purse to the winning jockey. I didn't figure that bad pay. Doing the mile and a quarter in 2:07⅗ I brought the owner about $63 a second, while I was earning about $8 a second for myself. Not bad pay, eh?"

"What do you earn annually?"

"I make about $50,000 a year."

"When did you first start riding?"

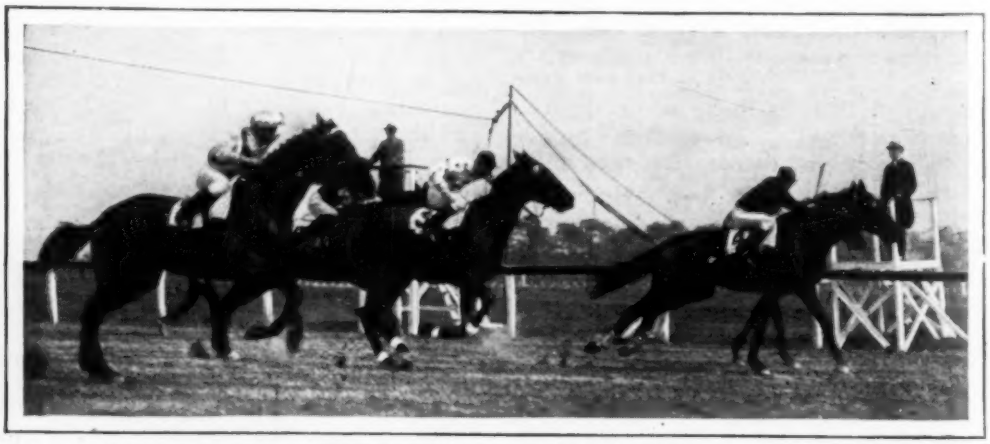
"Gosh," said this blond-haired youth, who doesn't look his twenty-nine years, "it goes so far back I can't remember."

"Well, what is the first horse-riding experience you remember?"

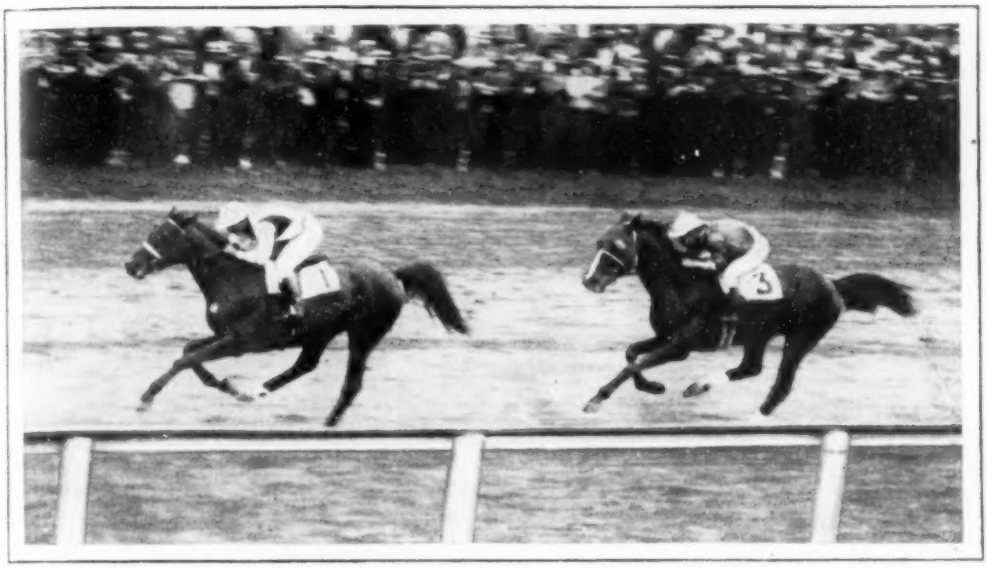
"That goes back to the time my family lived in American Falls, Idaho. I was fourteen then. At that time we were very poor. My father was boss of a section gang on the Milwaukee railroad.

"Without letting my mother and father know anything, I traded some ducks and my father's shotgun for a little roan named 'Babe.' My parents nearly went crazy when they found out what I had done. I thought they were going to kill me. But it was done and couldn't be undone.

"I started to ride 'Babe' in some of the pick-up races around the ranches. Then a cowboy of varied fortunes, who had seen me ride 'Babe,' wanted me to ride his 'cold-bloods,' which is a half-thorough-



Start of the Race at Jamaica, in Which the Colt "Sting" Set a New World's Record for the Distance of a Mile and Seventy Yards; the Barrier Is Seen above the Horses' Heads



"Peanuts," a Great Handicap Horse, Winning the Empire City Handicap, with "Sanford" Two Lengths Behind; Note the Jockeys' Crouch, Developed by Tod Sloan

bred, in some sprints. There was a sort of rodeo and carnival in town that summer. I got $2 for riding that man's horses. His name was Burr Scott.

"That winter I returned to school. One day Scott sent in a note to the teacher, stating he wanted to see me. He said he liked my way of riding and wanted me to go with him to Phoenix, Ariz., where he said I could make a lot of money as a jockey. So I ran away.

"We didn't do so well, and Scott got discouraged and quit the game. I started galloping horses for $25 a week. At the age of nineteen I struck out for New Orleans. Here I won my first professional race with one of Joe Goodman's horses."

From that time forward, Sande began to win. He took the Kentucky Derby, the blue-ribbon event of the American turf, twice, once with "Zev" and again with "Flying Ebony." He won the historic Belmont stakes four times, the Suburban handicap three times, the Metropolitan handicap twice with "Mad Hatter" and he was second in the Futurity thrice.

Sande has won so many races he has lost count. In 1925, he went through with 718 winners out of 2,680 starts. He says his average has been about the same since. Harry Sinclair, of the Rancocas stables, whose horses Sande rode one year, has earned more from Sande's services than anybody else. In that one year Sande netted Sinclair $564,000.

"In the old days," commented Sande, "I used to ride the whole card of six races a day for $10."

The life of a jockey, however, is not all clover. It is perilous. There are hardships to endure. One must fight against mental hazards and depression which might grow out of adversity. In 1924, Sande was badly injured at Saratoga while trying to edge through an opening next to the rail. He suffered a broken thigh. The wiseacres said he was through. Later he came back by winning the Derby with "Flying Ebony."

The jockey permits himself no dissipation, no matter how slight. Sande neither drinks nor smokes. Then there is the weight to think about. Every morning Sande takes to the road and jogs along for several miles. He is heavily clothed so as to knock off weight. He says when he can't make the weight, about 115 pounds, any longer, and the muscles begin to harden, he'll become a trainer. "But that's over ten years off," he said.

"What are the opportunities for young men in the jockey field?" he was asked.

"Well," he said, ponderingly, "well, I've told my story. Now if you were a young man what do you think? Would you want to do it? It's a matter for the in-

dividual to decide. Only one thing I say, the young man who contemplates the jockey game wants to be sure he can stand the gaff, there's an awful lot of ups and downs in the game. It takes a brave heart to fight it out."

BUILDINGS "EXPLODE" IN WIND TUNNEL TESTS SHOW

Model Smokestack on Bureau of Standards Laboratory Which Is Studied for Wind-Stress Data

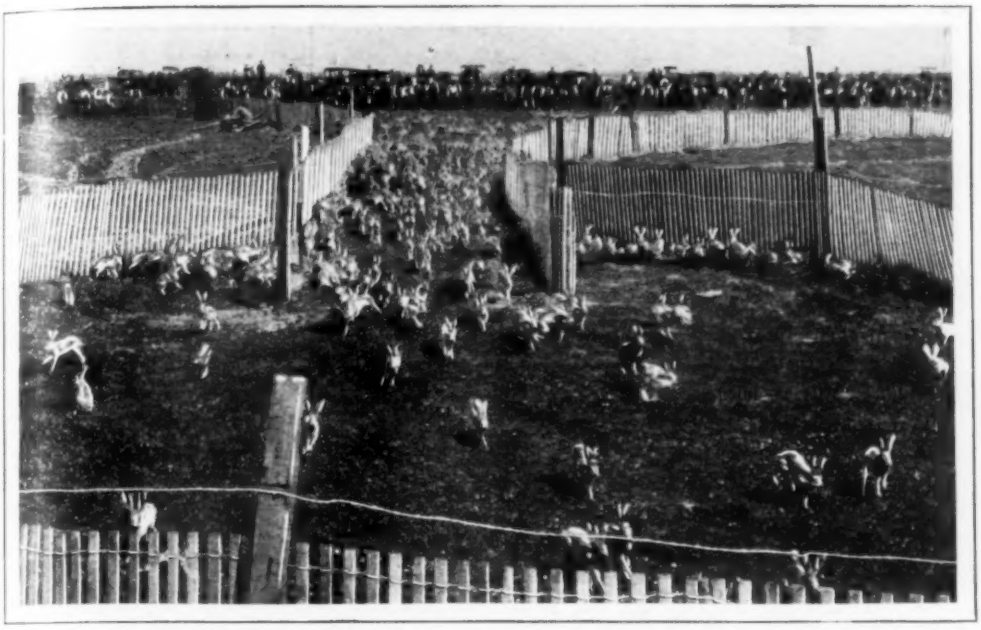
Interesting data concerning the behavior of structures of different kinds in severe winds are being gathered by tests at the bureau of standards. One of the units employed is a model of a typical factory building, erected within a giant wind tunnel through which strong air currents are forced. Preliminary results seem to show that suction rather than pressure tends to cause the building to explode outward rather than collapse inward. Another test involves a chimney, ten feet in diameter and thirty feet high, on top of one of the laboratory buildings. It is punctured with twenty-four holes in a circle, each hole connected with a pressure gauge so that experts can measure the amount of suction and pressure for each direction of the wind every fifteen degrees around the stack. Information obtained from this test will be arranged for the benefit of builders seeking to construct the strongest stacks within the range of efficiency and economy. Other experiments are staged to determine how much of a motor car's power is used to push the air aside and how aircraft behave in currents of varying velocities manufactured in the "cave of the winds," the bureau's big testing tunnel.

EARTH CRUST SIXTY MILES DEEP ACCORDING TO SCIENTISTS

Data gathered by the coast and geodetic survey indicate that the earth's crust is more than sixty miles thick, but that does not mean that the interior below is necessarily a molten, flowing mass. By "crust," the geologists mean the outer layer of the earth within which certain densities may be maintained, and their estimate as to its thickness was obtained by mathematical analysis of various earth movements. The crust is believed to be comparatively weak in order that internal adjustments may be made as readily as they are, after quakes, for instance. The investigators hold that the earth is solid throughout. Shifting of materials horizontally at the surface or below the crust, sets up stresses which express themselves in earth tremors. These occur almost every day as the seismographs prove.

TESTER FOR ELECTRIC WIRING SIMPLIFIES REPAIRS

Broken places in insulated electric wires can be located, without the necessity of extensive removals, with a novel tester recently introduced. It is constructed like a pair of pliers, the upper jaw being lined with old phonograph needles of metal. When these are pressed into the wire, the live side is quickly revealed on contact with the needles, but the tester is insulated to prevent injury to the user. It is said that the instrument does not damage the insulation on the wire.



Nearing the End; the Rabbits Have Been Rounded Up over a Wide Expanse of Country, Driven into the Corral and Will Be Killed; Drives like This Are Needed to Save Crops

RABBITS SLAIN BY THOUSANDS IN MONSTER DRIVES

Owing to the decreasing numbers of wolves, coyotes and other natural enemies, the jack rabbit is prospering in many parts of the west and, some years, infests the fields in such large numbers that wholesale slaughter is necessary. This is accomplished by a drive in which ranchers and townsmen over a wide area participate. The brush is beaten for miles around, the drivers advancing on foot, horseback, buckboard or auto, until the herds of rabbit are driven into a corral through a V-shaped barricade. They are then killed. Twenty thousand or more may be destroyed in a drive of this kind, and, for a few seasons, the rabbits do not cause such great damage. In California, losses caused by the animals have run as high as $600,000 a year in one county.

FANCY SUNBURN WITH STENCILS LATEST FASHION FAD

Stencil papers, cut in various patterns and applied to the skin, leave lighter areas when they are removed after exposure to the sun, so that an "artistic" sunburn is produced. The method proved popular last season at swimming beaches. Fruit growers have used this system for some time on apples and other products, initials of the orchard owner and elaborate designs being made on the fruit in the same manner.

Removing the Stencil Protectors After Skin around Them Has Been Sunburned to Produce Designs

Screen along Roadway, in Oregon, to Prevent Oil from Dripping into the Stream and Killing the Fish

FISH GUARDED FROM ROAD OIL BY CURTAIN ON BRIDGE

Oil splashing from a motor road into a trout stream in Oregon has injured the fish and marred the paint on the bridge, but the highway commission has found a way to end the nuisance by stretching a tar-paper curtain along the guard rail. It is securely fastened and placed high enough to protect the bridge, while the barrier below keeps the oil from trickling in from the road.

THE MOST DIFFICULT RAILWAY COVERS SEVENTY MILES

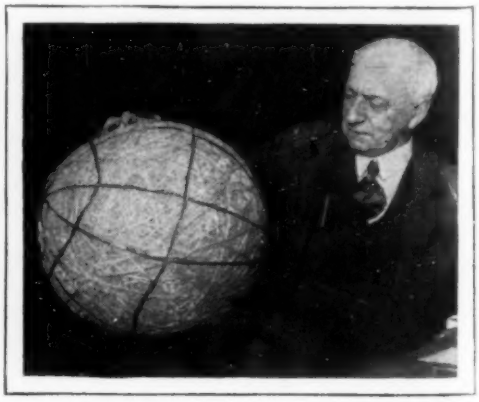
Twisting through a mountainous country between Mack, Colo., and Watson, Utah, the Uintah railroad is officially recognized as the most difficult line to operate in the United States. It is seventy miles long and is used principally for hauling a mineral employed in the manufacture of shellacs, varnishes, lacquers and insulation for high-tension electrical apparatus. In thirty-five miles, the road climbs from an altitude of 4,541 to 8,437 feet, and along another stretch there are nearly twenty curves to the mile. A specially constructed engine was necessary for this road in order to negotiate the sharp curves and the steep grades. In places, the bends attain a curvature of sixty-six degrees.

WHAT THE AIRMAN SEES BELOW

If the skies are clear, an aviator at a height of 6,000 feet can see more than eighty miles. How flying has pushed back the horizon is apparent when it is realized that a man five feet six inches tall, standing at sea level, can see but two and one-half nautical miles over the ocean. Ascending but 100 feet increases the limit of his vision to more than ten miles, at 3,000 feet he can gaze more than fifty-eight miles before the horizon interferes and at 6,000 feet, he can command a circular area with a diameter of 167.76 nautical miles, the horizon being half this distance away. A nautical mile is slightly more than 6,000 feet as compared to the usual 5,280 feet.

SEVEN-MILE BALL OF STRING AN EXAMPLE OF THRIFT

As an example of thrift, employes in the post office at Loomis, Calif., saved bits of string salvaged from packages, and before long had an enormous ball containing nearly seven miles of twine. The sphere, measuring five feet in circumference, was sent to the post office department in Washington.



Seven Miles of String, the Result of Saving Bits from Post-Office Packages at Loomis, Calif.

WINTER REFUGE FOR WILD ELK GIVEN TO GOVERNMENT

Deed to 1,760 acres of land in the Jackson Hole country of Wyoming recently was given to the government by the Izaak Walton league, as an additional refuge and feeding ground for wild elk that are driven out of the high portions of Yellowstone park and near-by country with the approach of winter snows. The land was purchased by popular subscription, more than $40,000 being raised from as many contributors. Between 8,000 and 10,000 elk are fed there each year. Two men are retained to grow and harvest the hay, which is distributed to the animals throughout the winter until they can return to their usual feeding grounds.

SCOOP FOR ICE-CREAM CONES SAVES TIME AND TROUBLE

Filling ice-cream cones with the ordinary dipper or disher is often attended with waste, loss of time and breakage of the cone. These difficulties are said to have been eliminated in a special scoop that shapes a serving of the cream to conform with the cone and permits dropping it in, point down, so that it fills the container and does not drip from the sides. An outward movement of a small thumb piece on the scoop allows the cream to fall into the cone. The unit may also be used for jelly, puddings or other dishes for the home table.

FARMYARDS AT SEA

Installation of flower gardens on some of the ocean liners, from which come decorations for the dining tables, recalls a queer craft that once plied between England and Ireland. It was operated entirely by women and was the sole means of livelihood of two elderly sisters. They had a well-kept kitchen garden and a poultry yard on the deck, and supported themselves by selling the products.

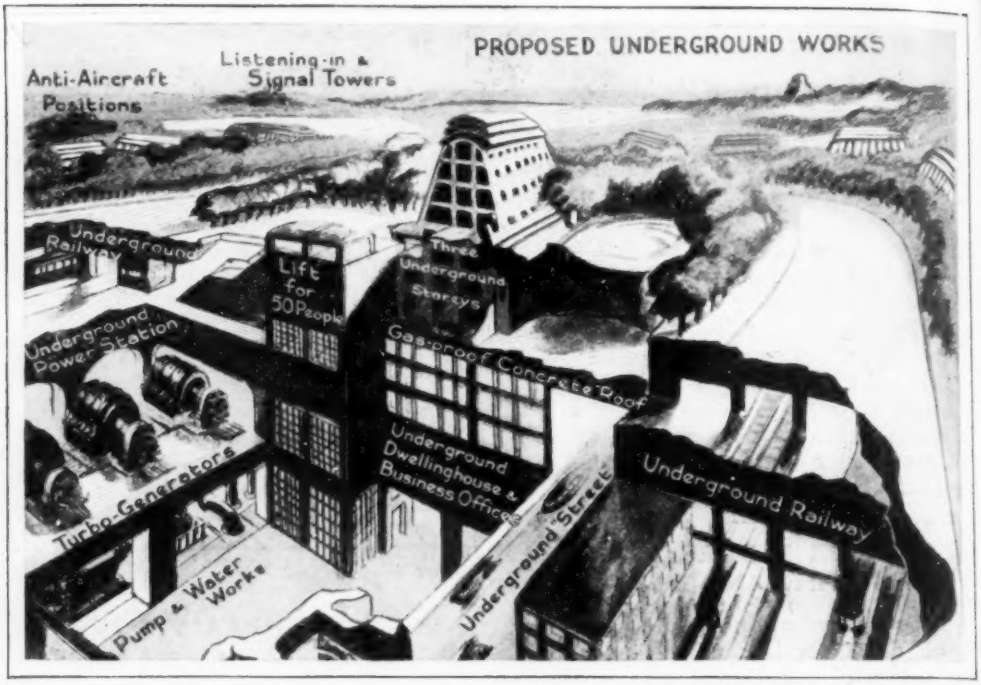
Painter Wearing Mask While Spraying; Note the Line Connected to Main Supply Pipe

AIRLINE FROM PAINT SPRAYER SUPPLIES WORKER'S MASK

Extra protection is afforded against the danger of inhaling poison fumes while spraying paint in a mask that utilizes air pressure from the line to the paint nozzle. A length of braided tubing leads from a valve on the main supply line to the mouthpiece so that a current of air is constantly available to the wearer without exposure to the fume-laden atmosphere. The mask is easily adjusted and the valve can be regulated to suit the operator.

VALVE GRINDER THAT FITS HAND EASES MECHANIC'S WORK

Reconditioning the auto valves is simplified by a grinder that is shaped to fit the mechanic's hand, so that he can obtain a strong grip and work with greater accuracy and increased comfort, instead of having merely a knob at the top or an awkward, cumbersome tool to grasp. There are no parts to get out of order.



Sectional View of Underground City, Proposed by Russian Architects as Protection against Bombs and Gas; Note the Above-Ground Building with Sloping Walls and Multiple Roofs

Bomb and Gas-Proof Cities of Future

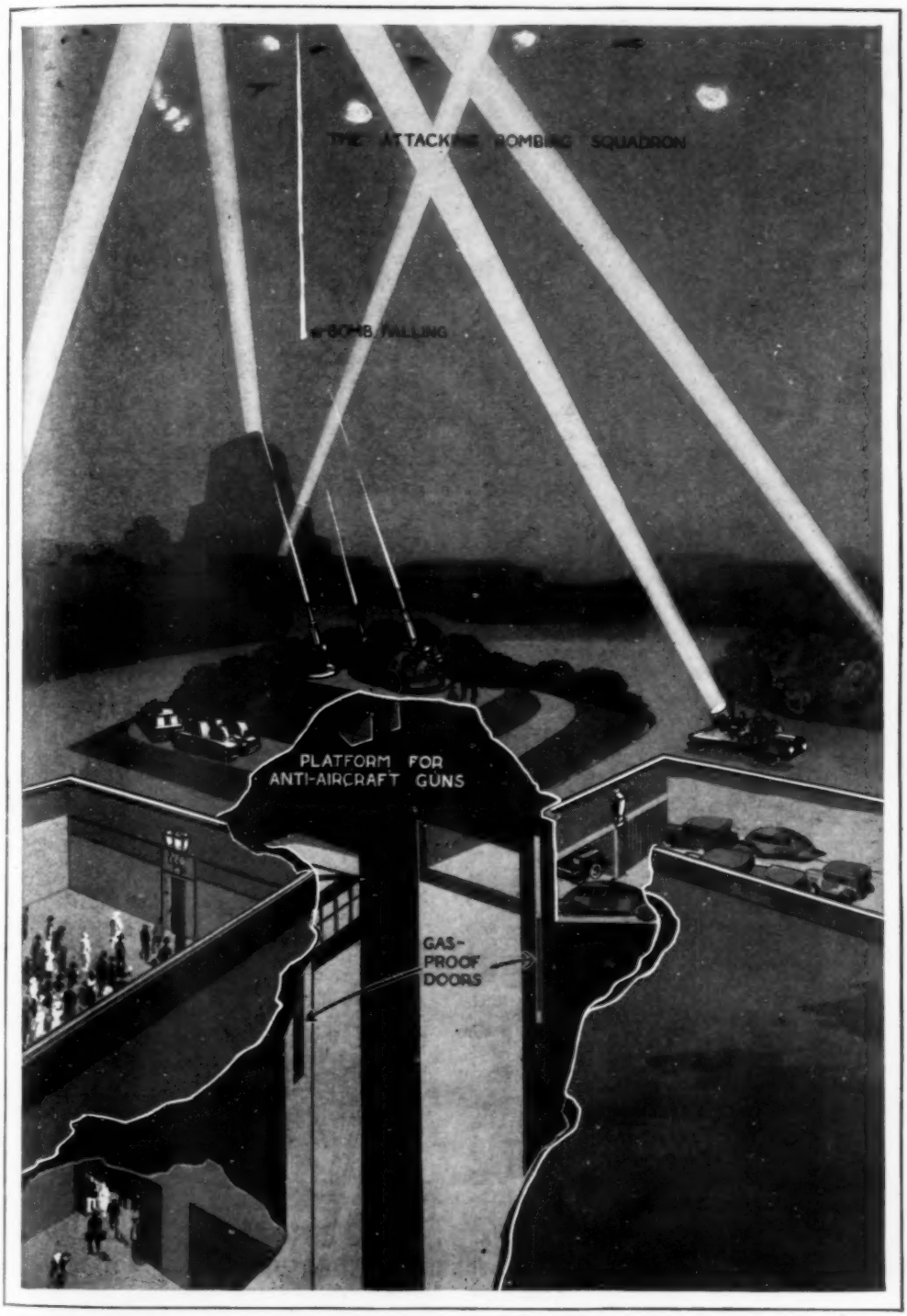
Russians Plan Weird Architecture to Save Civilian Population against Possible Attack by Fleets of Giant Air Raiders

MEN may have to go back to their cave-dwelling ancestors and live a large part of their lives underground; big cities may have to be decentralized and spread, in low-lying buildings, over vast areas, broken up by parks and open spaces, if the threatened horrors of aerial warfare really materialize.

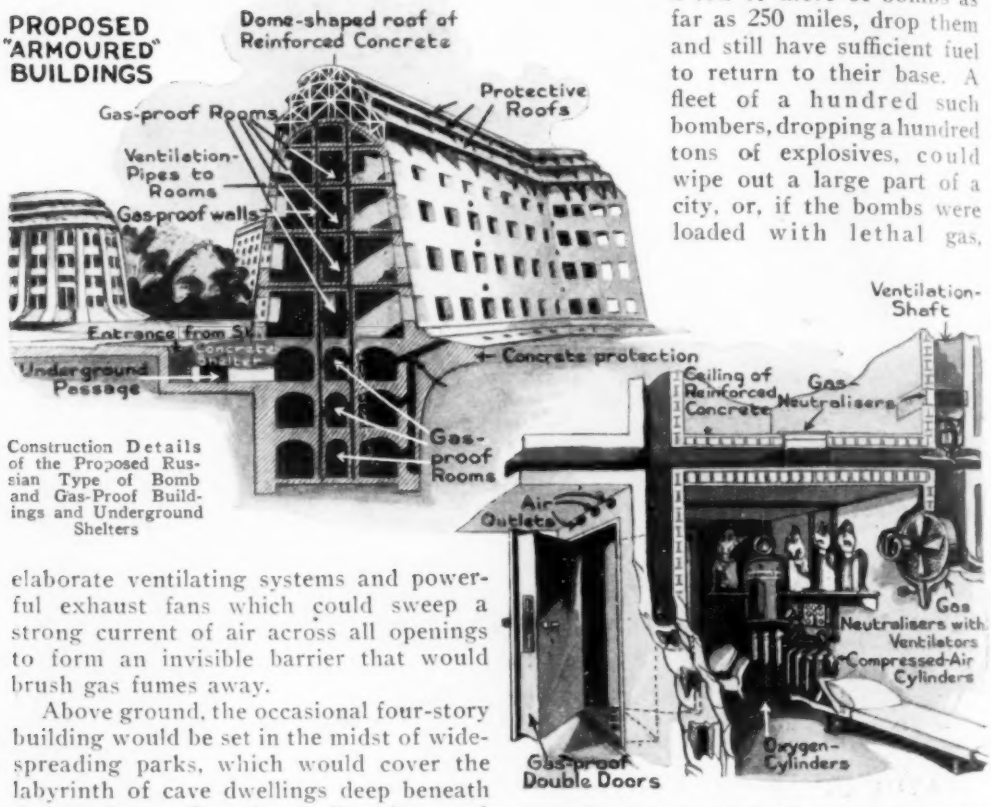
Those are the conclusions reached by soviet officials in Moscow, who are busy at work planning a gas and bomb-proof city capable of resisting attack from the air. The soviet architects featured a recent anti-war "Scare Week" with plans for such a city. The plans called for vast subterranean cities, covered by reinforced-concrete roofs, which in turn were buried under many feet of sod and earth. Railways and streets, as well as sidewalks, would also be placed underground.

Such buildings as would be permitted above ground would be limited to four stories in height. The outer walls would taper, to offer the smallest possible target from above, and they would be surmounted by triple reinforced-concrete roofs, with honeycomb air spaces between to take up the shock of an exploding bomb. The roof idea is similar to the blister plan used as a submarine defense for warships, an outer shell or blister exploding the torpedo on contact, and the inner space taking up the shock before the main hull is reached. Not all bombs explode on contact, but the triple roofs would offer sufficient resistance to stop even a penetration type and explode it before the interior of the building could be reached.

Every outlet to the air, including all doors and windows, would be rendered gas-proof, while the underground passages and refuge rooms would be protected against poison gas by double doors,



Night in the City of the Future, as Russian Designers Imagine It; the Civilian Population Finds Refuge behind Gas-Tight Doors Underground, While Bombs Rain on Broad Parks and Dissipate Their Force without Harm; Only Searchlight and Listening Posts and Battery Positions Are Manned above Ground



Construction Details of the Proposed Russian Type of Bomb and Gas-Proof Buildings and Underground Shelters

elaborate ventilating systems and powerful exhaust fans which could sweep a strong current of air across all openings to form an invisible barrier that would brush gas fumes away.

Above ground, the occasional four-story building would be set in the midst of wide-spreading parks, which would cover the labyrinth of cave dwellings deep beneath the surface. Occasional listening and signal towers and platforms for anti-aircraft guns would be interspersed among the scattered houses.

Another idea advanced by the Russians is the building of powerful gas neutralizers, which would draw the gas-laden air through water spray and chemicals and release it as pure air again.

The possibility of horrors in the next war beyond anything hitherto dreamed of is being given consideration throughout Europe, especially in Russia, Germany and England. A German magazine, Die Woche, recently pointed out that in the next war a city such as New York, with its tremendously tall buildings and enormous concentration of millions of defenseless people in a restricted area, would be "a giant with feet of clay, a veritable man trap." Bombing planes, the writer pointed out, have risen two miles into the air carrying a load of six and a half tons of bombs, besides the weight of the crew and their supplies. Modern bombers can carry a ton or more of bombs as far as 250 miles, drop them and still have sufficient fuel to return to their base. A fleet of a hundred such bombers, dropping a hundred tons of explosives, could wipe out a large part of a city, or, if the bombs were loaded with lethal gas, spread a curtain of death over a vast area. A 225 to 525-pound bomb would demolish a big building, and the larger sizes, weighing from 1,640 to 3,280 pounds, as used in bombing tests, would each wipe out an entire city block.

Lord Halsbury, former assistant inspector of high explosives in the British ministry of munitions, writing in the London Daily Mail, recently said:

"In a war of any magnitude there will not merely be armies engaging armies, but whole nations mobilized against nations. It inevitably follows that the old demarcation between the military forces and civilian population will cease to exist. The first conclusion that emerges is that an attack will be made upon the civilian population. From the dislike of facing unpleasant truths, an answer comes readily to many. 'London,' it is said, 'was bombed during the war, and not much damage was done after all.' The answer omits one very serious consideration. London was attacked with incendiary

and explosive bombs. Since then great strides have been made in chemical warfare. The only other answer that may be made is that it would be impossible to drop sufficient gas. Some two years ago, I pointed out that, in the vital triangle including the Thames docks and Clapham junction, 2,000 tons of gas would create a lethal atmosphere over all that area to a height of forty feet."

TIRE HEATER FOR LOCOMOTIVES SIMPLIFIES REPAIRS

When the big tires on the driving wheels of a locomotive become worn enough to require replacement, it is necessary to remove them by expanding with a heater. An improved unit for this work has recently been devised by a Pennsylvania railroad employe. While similar to others, it is said to eliminate the danger of burning varnish off the engine-wheel centers, jacket and cab, thoroughly heats the tire in about twelve minutes and is used in placing new tires on the wheel. It is so arranged that ignited gas from preheated oil makes a blazing ring around the wheel except six inches at the bottom.

STATUE OF COW ADVERTISES CITY CREAMERY

Statues of a cow were placed at several localities near Los Angeles, recently, to advertise a local creamery. The first figure was prepared from a live model, the artist keeping the cow near his studio.

Art for Advertising; Statues of Cow and Dairy Maid along California Highways Celebrate Creamery

Package Tier in Operation; String Is Easily Passed over Entire Bundle and Machine Is Movable

PORTABLE PACKAGE TIER SAVES TIME AND EXPENSE

For manufacturing plants producing merchandise in boxes, a package tier, recently introduced, can tie 45,000 boxes a day in approximately 2,500 bundles with but one operator required. It is said to wrap the twine about the parcel at even tension, preventing cutting or damaging the boxes, and eliminates the need of corner cards. Little skill is necessary to operate the unit, and it can be moved about to any convenient place in the shop.

PLAN TO DYE CAVALRY HORSES TO COMBAT AIR ATTACKS

Dyed horses and "shineless" saddles are under consideration at the cavalry school at Fort Riley, Kans., as a means of protecting mounted units against low-flying airplane attacks. It has also been suggested that a "flock" formation be adopted to keep the men scattered and so decrease the likelihood of heavy casualties in case of assault from the air. Tests have shown that the glint of the polished saddle-seat leather is easily visible to observers in the planes.

Bowlders in Stream Bed to Prevent Water from Tearing Out Bottom and Banks by Breaking Force of Flow

ARTIFICIAL BOWLDERS IN RIVER PROTECT BED FROM WEAR

A western irrigation district has found that river or creek beds, subjected to unusually high velocities, can be protected from erosion by scattering artificial concrete bowlders irregularly over the channel bottom. Those shown in the illustration proved effective where velocities were as high as thirty feet a second, and were made to contain two cubic yards of concrete.

VILLAGE SMITHY STILL HERE DESPITE AUTOMOBILE

That the "cough" of the motor has not completely displaced the clang of the anvil was shown at a horseshoers' convention in Jersey City recently, when it was announced that there are 70,000 blacksmiths in the United States today and prediction was made that the number would increase. In New York city alone, there are 65,000 horses, enough to keep many smiths' fires burning, and wise men of the craft have fitted their shops to do automobile repair work so that cars have contributed to their business instead of diminishing it.

RABBIT FUR GIVEN MANY NAMES

According to David C. Mills, general director of the national association of the fur industry, at least seventy-five names have been given to rabbit pelts in efforts to make the product more appealing to the purchasers. Among these are "Russian Leopard," "Moline," "Nutriette," "French Sable" and "Visionette." The fur is disguised by the skillful use of special dyes.

POLICEMEN CARRY TRAFFIC SIGNS ON BACK

Traffic policemen in Singapore carry rattan signs with red disks at each end, to direct autos. The disks reflect the light of approaching cars so that the drivers can easily see if the signal is set against them. To indicate a change in traffic, the policeman has but to turn the signal through an angle of forty-five degrees.

Singapore Policeman with His Lighted Rattan "Arm" That Helps Him Direct Traffic

SECRETS OF BIRDS' FLIGHT SOUGHT BY SCIENCE

Close View of the Flight-Recording Apparatus; Drawing to Show How It Is Adjusted to the Bird, and Reproduction of the Record Made

Courtesy Je Sais Tout

While the secrets of a bird's flight are not yet wholly solved, with an apparatus devised by two French scientists, accurate measurements have been made as to the amount of flying energy expended, the number of wing beats, speed, and other factors. The bird registers its own record of its flight on the instrument, which is essentially a small revolving drum actuated through a system of levers and strapped to the bird's back in such a way that wings, feet, neck and tail are left free. The drum makes a revolution every six seconds, starts automatically when the bird is released, and shows the flight record as a wavering line on the drum. The curves illustrated here represent the flight of a pigeon. They show that the bird started slowly and beat its wings at the rate of six to eight times a second at the beginning, sufficient to sustain four times its own weight. A complete "report" of a pigeon's performance from the time it was started until it returned to its loft has been made with the unit. One of the interesting facts revealed is that a bird flies on an almost negligible expenditure of energy because it takes advantage of both natural air currents and those created by itself for support and motion. The problem is: To what extent can these forces be applied to future flying machines? Experts do not hesitate to state that means of making such application soon will be found and among them are some who even presage from the experiments the realization of man flight by his own muscular power.

JUST ONE

The Gales Blow So Hard That the Icicles, Clinging to Life Lines and Rails, Stick Out at Weird Angles

By EDWARD BERNARD

A RACE with death and disaster, with $150,000,000 as a side bet, is run every year on the waters of the Great Lakes, in the effort of several hundred vessels to make "just one more trip."

Ships of the lakes that sail through placid waters during the calms of spring and summer, become places of fear when the order comes for that one last trip.

Captains, ever watchful, knowing that an accident means wrecked ambitions, spend sleepless nights and foodless days when the time of year comes for the one extra voyage, the last of the year's cargoes.

Insurance companies will not take a chance on the last trips. Owners may make their bets with the Storm King each year if they will, but after midnight, Nov. 30, the underwriters declare hands off. They refuse to wager. Last year $150,000,000 in ships and cargoes remained locked in the ice near the Soo.

"One more trip," declared Capt. Albert J. Mahon of the steamship "John J. Barlum" as he pulled out of Duluth with a cargo of ore, Chicago-bound.

Three hours later he faced the worst gale of his forty years on the lakes. Great waves that none of the thousands who take pleasure trips to lake resorts every year have ever seen, swept the vessel. Ice formed everywhere and officers climbing into the wheelhouse were forced to cut a tunnel through to the door.

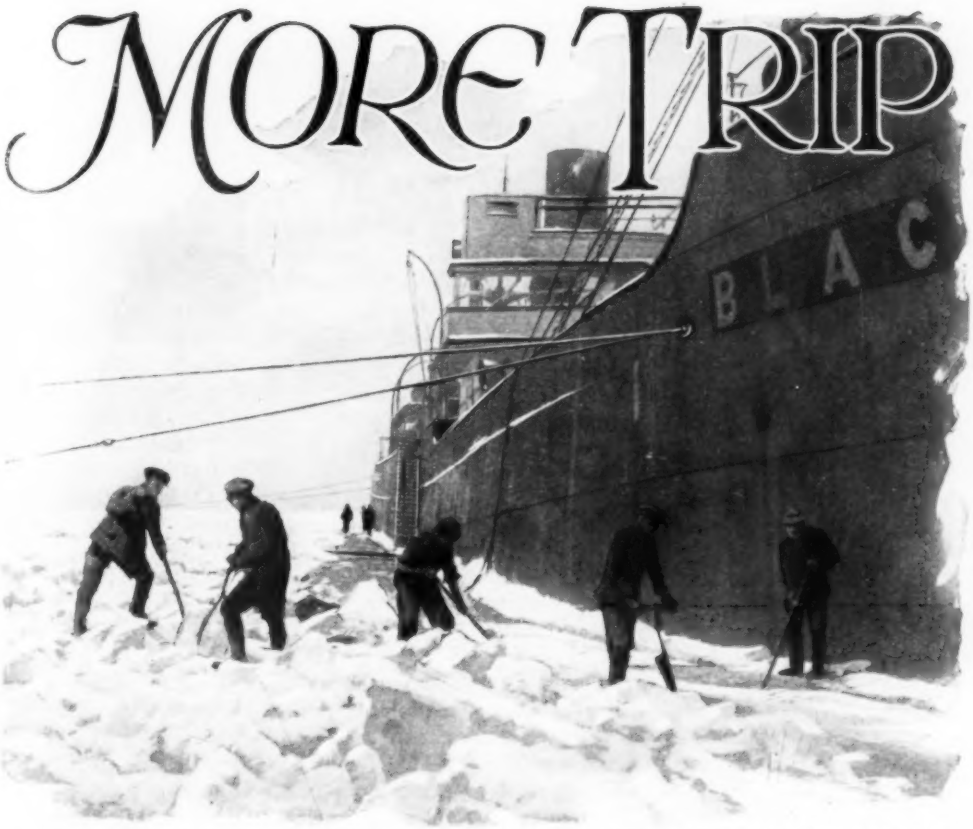
"Guess we'll have to pull over before we roll over," said the captain, as he gave the order that swung the big 505-foot freighter at right angle to her course, a point off Michipocoten island. Down the opposite shore of Lake Superior the steamship rolled by Copper Mine Point, within a few hours of the time when another "last tripper" had gone ashore.

This was the steamship "Cottonwood." Her crew got ashore. No more desolate spot could be found in the entire lake country. Suffering from exposure and lack of food, volunteers chose to risk the lake in a small boat to bring relief to their fellows. Those on shore waited through a long night, fires being kept burning to ward off hungry wolves heard near the miserable camp.

Neither ship was equipped with wireless, said Capt. Mahon, and the "John J. Barlum" knew nothing of the "Cottonwood" disaster until hours later.

Tacking back and forth across the greatest of the lakes, the steamship acted as did the sailing vessels of years ago and

MORE TRIP



Crew of a Big Grain Carrier Working to Chop a Lane in the St. Lawrence, to Give the Boat Room for a Short Run, So That She Could Ram the Ice Pack and Split It Apart

yet such navigation saved the $1,000,000 boat and her $1,000,000 cargo of ore.

Forty-three hours Capt. Mahon stood at the window of the wheelhouse, staring into the gale. Once he lunched on sandwiches and tea, never once attempting to make the galley. Men forward dared not venture aft for meals. Many went hungry for hours rather than attempt passage over a wave-swept deck.

Down Lake Michigan, the storm continued and when the big vessel nosed her way down the Calumet river to the docks of the Wisconsin steel company, all hoped that the last trip of the year had been made.

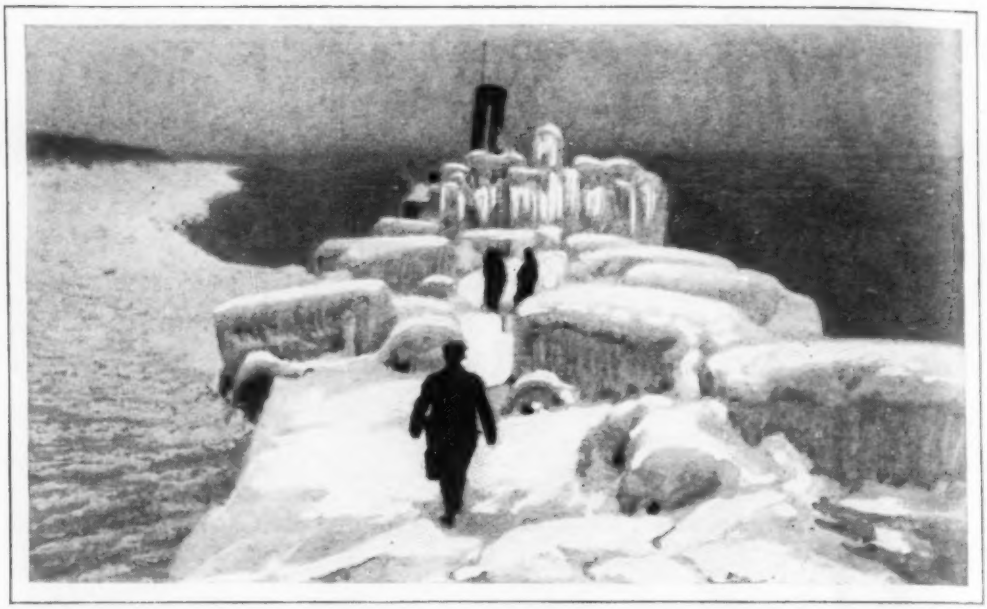
"Ashland for cargo of ore," came the crisp order over the wire. Captain and crew who had weathered the worst storm of the year were again off on "one more trip."

Out on Lake Michigan that night, steaming along in ballast, the captain soon learned that the elements knew no mercy. Straight north the ship headed into another gale, the wind growing in volume each hour, bringing another sleepless night for the skipper. Lights ashore told their story of snug Chicago apartments, warm homes, gay dinners in palatial hotels. Aboard the "John J. Barlum," what a contrast! In the wheelhouse the captain and P. J. McCarthy, first mate, got the vessel on her course and through the darkness discussed the fury of the gale just passed and the possibility of the one brewing.

At the Soo warnings were out and when the "John J. Barlum" passed Whitefish Point, headed due north, twelve ships were anchored behind the shelter.

During the day the captain told of disasters that came upon ships of the past that ventured one last trip.

"Caribou island, to the port," he began, "was the scene of a sad wreck. The famous Minch family of Cleveland built



With Hold Full of Automobiles and Hundreds Lashed to Her Decks, "The City of Bangor" Was Driven Ashore in Lake Superior by a Winter Gale; Note the Ice-Covered Cars

what was then the largest steel vessel on the lakes. Five members of the family came along with the captain on what actually proved to be the ship's last trip. During the night, the steward started forward to bring some food to the owners. Amidships he saw a great crack in the vessel—she was breaking in two. Only time enough remained for him to grab a life preserver and sound a warning. But, it came too late. All were lost, except the steward. He was picked up twenty-four hours later."

The year 1926 will go down in history as the year of the big winds on the lake, declared the captain. "Worse than 1913," he maintained. "That was the year of the many wrecks—the 'Charles S. Price,' 'Isaac M. Scott,' 'Henry B. Smith,' 'John A. McGean,' the 'Argus,' 'Hydrus,' 'James Carruthers,' 'Waxford,' 'Regina,' 'Leafield,' all gone.

"It was along here, probably further back near Whitefish Point, that the 'Orinoco' and her tow were wrecked two years ago. The towline was cut and the captain ordered the crew of twenty off in boats. He was Capt. Lawrence—a fine fellow—and, with the chief engineer, Joseph Wurtz, and wheelman Hugh Gordon, remained on board. All three were lost. Twenty hours later the crew made Montreal island, two of them having died from exposure.

"O, I tell you, sailing at this time of the year is no pleasure business."

Officer McCarthy was on duty when the first blizzard on the trip north was encountered. One could see it miles away, and the ship rushed into a dense wall of gloom—one minute sunshine, the next darkness. Immediately the whistle started its fog warning and just in time. Out of the darkness appeared another ship.

A man on the bridge with a megaphone meant a message. It was caught as the two vessels rushed by. "Five inches of ice in Ashland harbor," the voice said.

The next day, after another sleepless night for the skipper, Apostle islands were sighted. "Too bad we can't see Isle Royal, way over there to the port," said Capt. Mahon. "It's the scene of the lakes' worst disaster. It's where the 'Algoma' was sunk with more than 200 aboard.

"Funny thing, too, about the 'Algoma' wreck. Years ago I had a wheelman, who, despite his 35 years, was white-headed. I liked him very much. Once when passing Isle Royal I remarked about it being the scene of the wreck. The wheelman turned to me and said, 'yes, captain, I

was the man at the wheel in that wreck.' His premature white hairs were explained."

Docking a 505-foot freighter in the dark, through a solid sheet of five-inch ice formed just one of the many incidents of the "John J. Barlum's" trip. A tug came to assist.

"We'll go in stern first," said the captain. "Ice will form during the night and I don't want to chance the rudder."

That night the crew worked tirelessly. Holds, after they were filled with ore, must be covered. Each hatch must be covered with canvas—no small job when the canvas is frozen stiff. Winter came to Ashland early and hands were frozen, ears nipped. But, throughout it all came the piping tunes of the "John J. Barlum" ditty:

"If you only knew there are men in the crew
From Amherstberg to Harlem.
When your work is through, there's nothing to do,
On the good ship 'John J. Barlum.'"

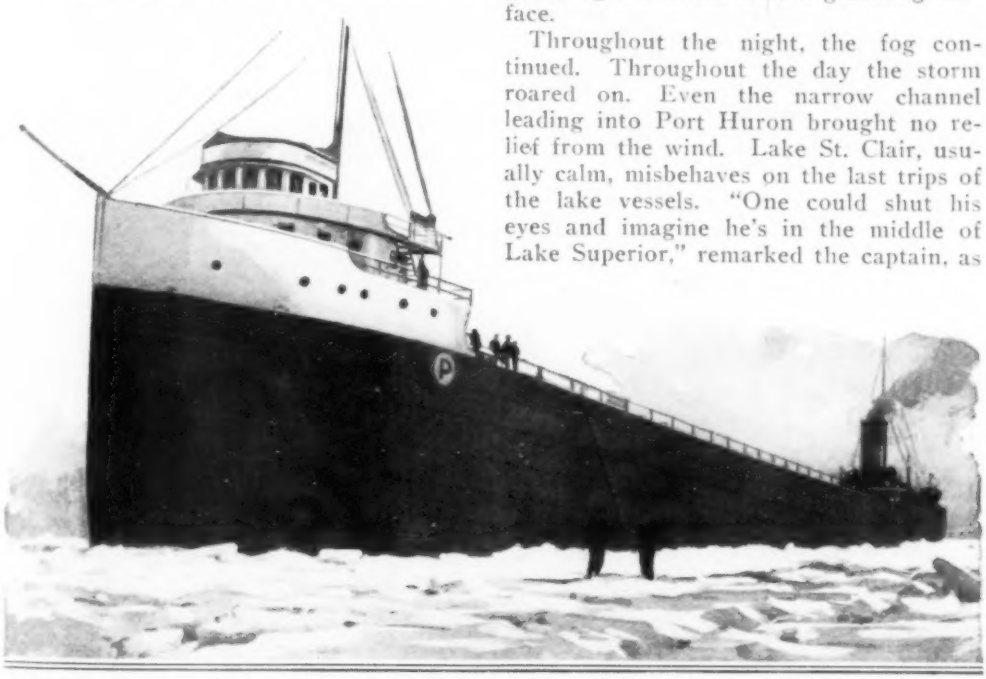
The next morning the "Barlum" cut through six instead of five inches of ice. Then came a nor'wester and, when Whitefish Point was sighted, the gale registered fifty-two miles an hour.

"On the ship ahead of us coming down on the last trip, the men stayed forward two whole days, not daring to cross the decks for their meals," declared the captain. "You see, heavy seas were breaking over the decks and ice formed about the life line to such thickness as to make it useless. One of the men, declaring he would rather drown than starve, made a dash for his dinner. But, he was caught amidships and went overboard. Of course his body was never recovered."

Captain Mahon of the "John J. Barlum"

Cheerful talk, this! Spray, by this time, freezing as it fell, had completely covered the decks with a coating of ice. True, it had been the means of decking the steamship in Thanksgiving holiday attire, fringing the cables with pearl and polishing the decks with a gleaming surface.

Throughout the night, the fog continued. Throughout the day the storm roared on. Even the narrow channel leading into Port Huron brought no relief from the wind. Lake St. Clair, usually calm, misbehaves on the last trips of the lake vessels. "One could shut his eyes and imagine he's in the middle of Lake Superior," remarked the captain, as



The Steamer "John J. Barlum," Caught in the Ice of the St. Marys River, below the Locks at Sault Ste. Marie, on Her Last Trip of the Year up the Lakes for a Final Cargo

the ship plunged on toward the rosy glow that indicated Detroit.

Lake Erie meant more wind and Cleveland was welcomed by captain and crew.

"Do we tie up here?" the question was asked of man to his officer, the officer to the captain.

The owner answered. It was an order to make "one more trip." This time to Chicago with a cargo of coal.

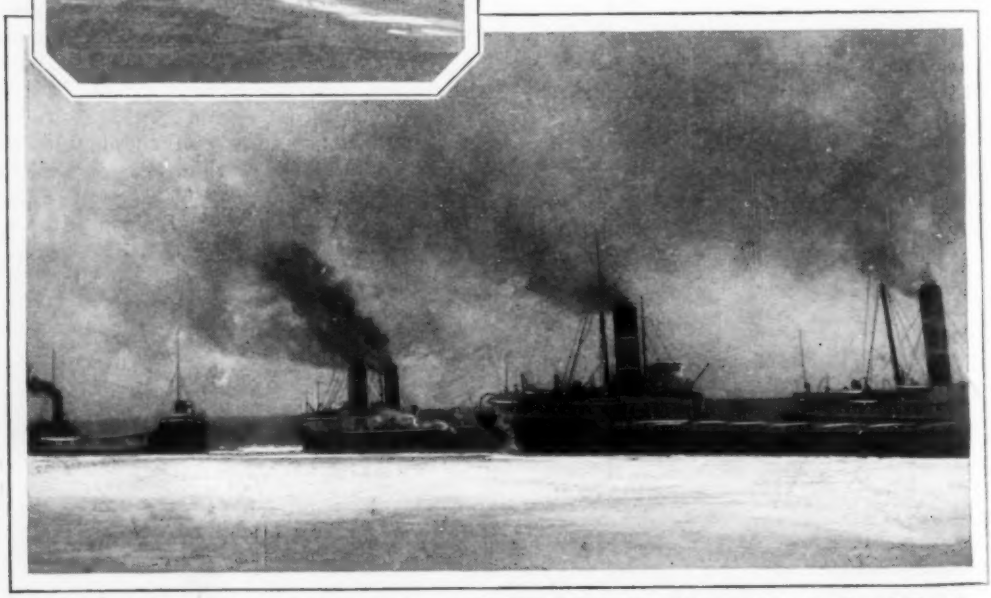
Midnight of November 30 had passed and when on the first day of December the "John J. Barlum" started on her "one last trip" she contributed to the annual $150,000,000 bet made by lake ship owners.

For insurance ceases. Owners may take a chance. Crews may ship aboard vessels in the danger season. Skippers may follow orders that mean sleepless nights and double worries. But, insurance companies say, "nothing doing."

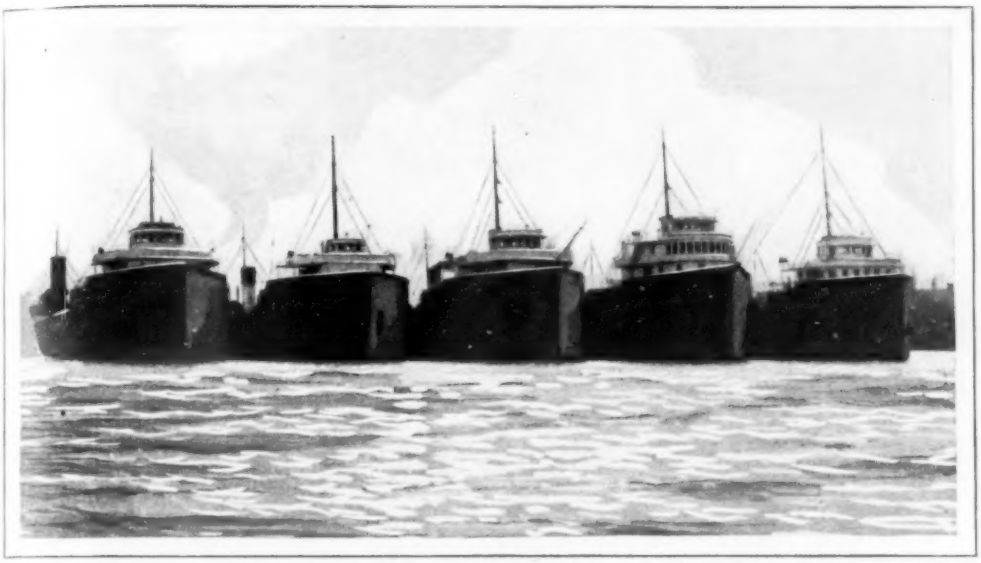
Once again started, the "John J. Barlum" began her last trip. Through gales and fogs she gamely fought her way into the St. Marys river, where with more than 100 of her kind, she succumbed for a time to the onslaught of winter. For days her men stayed aboard, waiting for the laboring tugs to clear a passage. None dared leave the boat to make shore, for the lake ice was treacherous. One man attempted it from another vessel and his life was the forfeit.

Then the day came when passage was cleared. The "John J." headed for Chicago. One of the winners in the $150,000,000 bet, she berthed into a snug haven and when the orders came to "tie up for the winter," the "John J. Barlum" had made her "one last trip."

Less fortunate was the freighter "The City of Bangor." With holds and deck loaded with a consignment of automobiles from Detroit en route to Duluth, she was driven ashore near Keweenaw Point in the Upper Peninsula of Michi-



Ice-Breaking Tug Opening a Road for the Ore and Grain Carriers, Top, and Part of the Ice-Bound Fleet in the St. Marys Waiting Their Turns to Be Released



Tied Side by Side, Five of the Low-Lying Ships, Each with Its Ten or Twelve Thousand Tons of Ore, Wait for the River Passage to Be Opened for the Dash to Safety

gan. There she remained where help could not reach her and slowly she became ice-incased, which was all that saved her from being dashed to pieces.

A constant watch had been kept on board the ship but it was finally decided that all efforts to salvage the boat itself were useless, so the insurance underwriters turned to the salvaging of the cargo. Two hundred automobiles is too valuable a cargo to let Lake Superior claim, and a firm of wreckers were given the task of removing the cars. The task was not an easy one, requiring the building of a road for a distance of several miles through a heavily timbered country on shore before any communication could be established with northern Michigan towns not isolated by snow.

The majority of the cars were stored below the decks and were hoisted with block and tackle to the improvised ice road leading to shore. Those on deck were ice-incrusted and were pried from their firm footing by jets of steam.

ELECTRIC SAW FOR BUTCHERS SAVES TIME AND WORK

Swung from a shaft attached to the ceiling, an electrically operated circular saw for butchers is adapted to a wide variety of work, saves time and effort and requires practically no attention except an occasional oiling. The outfit is so arranged that the current is automatically shut off when the saw is released, preventing waste, and is turned on simply by lowering the blade into working position. The saw is so balanced that the blade is raised out of the way, so that it cannot injure the operator, at the same time he lets go of the handle. Power is supplied through a lighting socket.

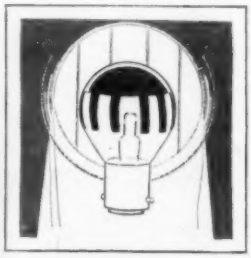
Cutting Meat with the Electric Saw; It Is Suspended from the Ceiling for Easy Manipulation and Swings Out of Way When Not in Use

FROM STAGECOACH TO THE LATEST EXPRESS PLANE

Posing to Show How Transportation Methods Have Changed; the Stagecoach Pays Homage to the Airplane as a Passenger and Express Carrier

What will be the next mode of travel? The question cannot be answered, but changes in the past justify replies that may seem fanciful, for who, in the days of the stagecoach, would have believed that travel by air would be common in a few decades? Old and modern methods of transportation were illustrated recently in Chicago when a stagecoach was drawn alongside an express and passenger airplane for the Chicago-Dallas service.

AUTO LIGHT IS SELF-DIMMING AND PENETRATES FOG



Fifteen per cent more light on the road ahead and greatly increased fog penetration are claimed for an automobile headlamp bulb that dims itself without attention from the driver. To approaching motorists it appears to grow less bright and almost vanishes at closer range, due to the special design of the bulb, although it affords the operator a constant illumination ahead. The units fit any type of automobile lamp.

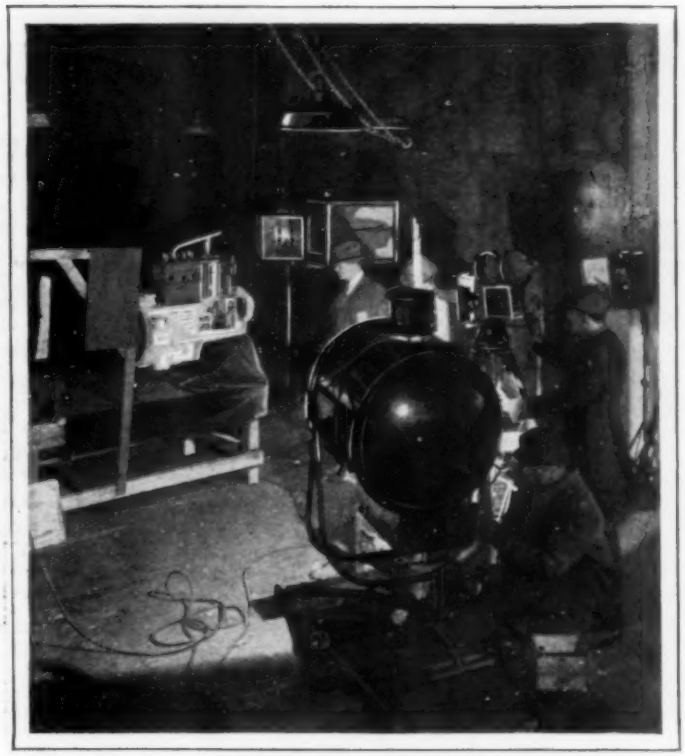
SCOTLAND YARD ENLISTS RADIO TO HELP CATCH THIEVES

Scotland Yard's recently organized radio squad has been doing effective work with specially designed sets by which quick communication is established between units touring the city districts and the central office. The detail has proved especially useful in frustrating automobile thefts. In a recent three-month period, only one attempt at auto stealing out of 100 was successful. When riots were threatened during the Sacco-Vanzetti disturbances, a squad of detectives in a motor car heard that a march was proposed on Buckingham palace. The squad immediately radioed the word to Scotland Yard and, before the procession could get under way, 500 police, mounted and on foot, were in readiness to disperse the demonstrators. A window-smashing gang had planned to steal a quantity of diamonds

displayed in Cartier's famous shop in Bond street. The Yard heard of the plot, within a few moments the store was surrounded by detectives and, when the thieves drove up in their luxurious automobile with chauffeur attending, they were promptly arrested. The catch was made ten minutes after Scotland Yard had been tipped off.

LUMBERING AIDED BY AMPHIBIAN TUG

Lumber companies in Ontario, Can., are utilizing a land-going tug in districts where booms of logs have to be towed on lakes and rivers to the mills. The craft is scow-shaped and driven by two propellers when in the water. It can pull itself out of a stream and travel across country to the next body of water where there is work for it to do. This is accomplished by means of a steel cable, anchored to a tree or other solid object and wound up on a drum on the tug. Portages of five to ten miles are often made by these craft, which are solidly built and fitted on the bottom with iron-shod oak runners.



In the Bureau of Mines Motion-Picture Studio, Showing One of the Big Lights for Filming Interiors

It Can Travel on Land as Well as in Water; Lumbering Tug Which Propels Itself between Streams

ROMANCES OF INDUSTRY TOLD IN MOVIE LIBRARY

More than sixty subjects involved in the romantic task of taking wealth from underground are depicted in a series of motion pictures prepared by the bureau of mines. The work has been going on for eight years, and elaborate equipment, including portable lighting facilities that furnish 12,000,000 candlepower, has been devised for the task. One of the illuminating units is a huge searchlight somewhat like that used on airplane-landing fields. Fifty trunks of lighting apparatus are employed. In filming the "Story of Copper," many of the reels were taken 8,000 feet below the surface.

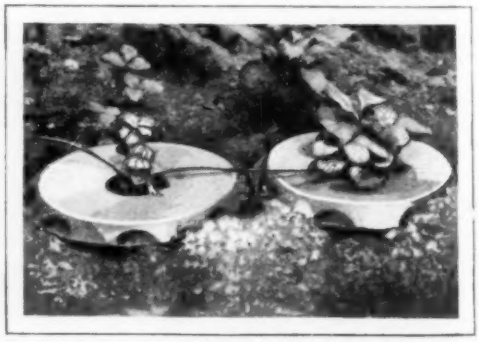
In the Dining Room of the Ahwahnee Hotel in the Yosemite; the Huge Window Makes a Frame for the Distant Falls

HIGH WINDOW FRAMES FALLS IN YOSEMITE HOTEL

One of the features of the Ahwahnee hotel in the Yosemite valley is a dining-room window, thirty-five feet high and fifteen feet wide, that forms a frame for the falls, not far away. The effect is that of a huge moving picture and greatly adds to the novel decorations of the room. The building is made of natural rock rolled down from the cliffs above, the color scheme of the exterior follows the tones of the pine needles and valley sides, and Indian and Spanish influences are carried out in various parts of the hotel. Of special interest is the men's lounge, which has been decorated to suggest early days in California with red-and-blue checkered curtains like a miner's shirt, oil lamps, buffalo and black-bear skins on the floor and other mementos of the gold-rush period worked into the decorative scheme.

"COLLARS" SPEED PLANT GROWTH

Swiss gardeners are credited with the introduction of a simple unit that is said to stimulate the development of seeds and plants, resulting in quicker germination and better products. It is simply a disk-shaped collar which is placed about the seed or the plant, to attract and retain the heat of the sun, acting as a sort of miniature hothouse. There is a hole in the center and the disk is shaped to convey water toward the middle so that the plant receives additional benefit from showers, and evaporation is reduced because of the covering. The task of weeding is likewise simplified and there is less likelihood of uprooting the plant, since foreign growths do not spring up close to the stalk. Tests are said to have shown that tomato plants grew to nearly twice their usual size when protected by the collar, and tobacco and cotton showed equally marked development. The disks will last for five years, it is claimed.



Plants Wearing Their "Collars"; These Units Attract Sunshine and Help Retain Moisture

¶About 100 tornadoes occur in the United States every year.

The Tricks of the Ghost Hunters

How Fake Spirit Manifestations, Which Often Deceive Even the Most Skeptical, Are Produced

By WALTER B. GIBSON

HEREWARD Carrington, who has for many years endeavored to establish certain psychic phenomena as genuine, declares that "ninety-eight per cent of the physical phenomena are fraudulently produced."

The purpose of this article is to give an insight into the methods by which fake spirit manifestations are performed, and to show that the means employed by fraudulent mediums are like those used by magicians. The important distinction lies in the fact that the magician's work is justifiable, as he claims no supernormal power, whereas the fraudulent seance is nothing more than a swindle.

Spirit slate writing, or the production of messages on blank slates, has been performed for many years and still flourishes. Some of the methods used today are remarkable for their ingenuity. Take, for example, the bolted slates. Two slates are shown to contain no writing, and are bolted firmly together at all four corners. The slates are marked for identification. The lights are turned out for a few minutes, then they are turned on; the slates are unbolted, and a message is found written upon the inner surface of either of the two.

Special slates are used. Close attention will show that the frame of the average slate is made in four sections. One of the special slates is constructed so that the end is removable. When the end of the frame is pulled, the slate slides out with it, and the medium is free to write on the inner surface of either slate, or to write on a card that may be between the slates.

Slate writing also may be performed with a single slate. The slate is shown blank on both sides, and is placed in a paper bag. When the slate is withdrawn, a message is found upon it. In this case, the writing is already on the slate, but is concealed beneath a layer of thick black paper or very light cardboard, which appears to be the surface of the slate. When

EVEN BOLTED SLATES MAY BE OPENED EASILY

the slate is taken from the bag, the paper covering is dropped off and remains in the bag.

The exchanging of slips of paper is one of the most indetectible of all the tricks of fraudulent mediums, some of whom rely upon it alone. It is called the "billet switch," and is performed in various ways.

In one system, the original question is folded and placed on the table so that it stands with the creased edge upward. The medium holds the dummy slip edgewise between the middle fingers of his right hand. He places the hand around the original question, and as he slides it toward him along the table, he pushes the dummy up with his right thumb and, at the same instant, his fingers bend in and press the original slip into the palm of the hand. To all appearances, the hand has merely picked up the original question and moved it to another part of the table.

In utilizing the billet switch alone, the operator asks that a question be written on a slip of paper, which must be folded. He picks up the slip, making the switch, and presses the dummy question against his forehead. He changes hands, which enables him to place the original question in his lap, and quietly unfold it.

Then, looking slyly downward, he reads the original question and starts to answer it. He folds the original slip, and when he has answered the question, he drops the dummy on the table. He picks it up immediately, making the switch once more, and hands the original slip back to the writer. Strangely enough, this test often works more smoothly when the medium is blindfolded, because, with a loose blindfold, he can look downward easily and read the question in his lap.

Some mediums have methods whereby they can learn what the sitter has written without exchanging slips at all. This may be accomplished by the use of carbon paper. If the sitter is given a pencil that contains hard lead, and is told to place his slip upon a piece of cardboard, the medium may obtain a copy of the question by having a sheet of carbon paper on the cardboard, covered with a thin sheet of paper of the same color as the board.

Another and more elaborate method involves the use of a special table, which has a top covered by parchment or thin leather. Under the table covering is a sheet of carbon paper and beneath this a piece of thin white silk. The sitter writes his question on a paper on the table, which, of course, is transcribed on the silk. A string runs down the table leg,

AN OLD MAGICIAN'S TRICK IN SWITCHING MESSAGES IS OFTEN USED

and, when an assistant pulls the string, the piece of silk goes through the floor, where the confederate reads the question.

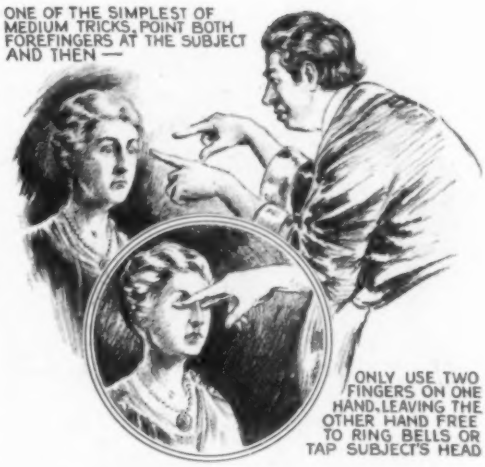
Then there is a form of pencil reading that may be compared to lip reading. A person skilled in this art can learn what another person is writing, without seeing the paper, or being close enough to read the written words. The medium stands at a distance and carefully watches the top of the writer's pencil. The movements of the pencil indicate the letters which are being written, and a keen observer can identify many words in this manner. This system is generally used only when the sitter is told to write the name of a departed friend, from whom he or she

wishes a message. The medium can often learn either the first name or the full name by watching the top of the pencil.

When a medium insists that a question be written, that, in itself, is an indication of trickery. All sorts of pretexts have been given why the sitter or spectator should write a question, for instance, to "concentrate his thoughts," to "check up the spirit answer," or some such reason. Nevertheless, when a medium insists that questions be written, it is a sure sign that he or she has some method of learning what is being written.

Sealed-letter reading has been employed by self-styled mediums for many years. The old reliable method depends upon a sponge soaked in alcohol. When the face of an envelope is rubbed with the sponge, the paper becomes transparent, and the medium can read the question inside. But this method has been broadly exposed.

There is a form of sealed-letter reading in which the medium holds up an envelope, and answers a question written by a confederate. Then he tears open the envelope, and reads off the confederate's question aloud, but at the same time reads the writing which is actually on the question which he holds in his hand. Thus he learns somebody's question. He holds up another envelope, and answers the question which he has just learned. He opens the envelope and reads aloud the question which he has just learned, at the same time reading the new question to himself.



This is an old method; it can be performed as an impromptu trick with good effect, but most magicians think the trick is too well known. Nevertheless, it is used constantly by a certain medium whom the writer has seen in action, and this man performs it so artfully that the trick is never detected. As he finishes reading a question aloud, he holds the slip of paper so his audience can see it, and calmly says:

"There is your question; you wrote it hastily, but that was all the same."

The person who wrote the question is seated too far away to observe that the medium is showing him a question written by someone else, and he takes the medium's statement in good faith.

In dark seances, where the medium is bound, but still manages to produce certain manifestations, the principal trick lies in the method whereby the medium temporarily frees himself. Many of these tricks have been exposed, but new ones constantly replace them. Here is a method which is virtually unknown:

The medium has two metal rings, each with a chain attached. He slips one hand in each ring, and a person on his right holds the end of one chain, while another on his left holds the end of the second chain. Obviously, one person controls each of the medium's hands; yet when the lights are turned out, some startling phenomena take place.

The trick is easily accomplished. The medium simply slips his left thumb into the ring which encircles his right wrist.

Then he removes his right hand which is free to do its appointed task. When he calls for the lights, he can instantly slip his right hand back into its ring. In fact, the operation is so quick that the medium can meet any emergency.

A story is told of a fraudulent "trumpet medium," who customarily freed his right hand and used it to manipulate a trumpet through which he talked. At one seance, the investigators insisted that the medium fill his mouth with water. Despite the handicap, the voices talked through the trumpet. The medium accomplished this very artfully. Among his paraphernalia was a bell. As soon as the lights were out, he released his hand, inverted the bell and raised it to his mouth. He deposited the water in the bell, and set the bell carefully between his knees. He was free to proceed with the trumpet manifestations, and when he had finished, he filled his mouth with the water from the bell again.

There is a clever little trick which demonstrates how easily a hand may be freed without anyone knowing it. This can be performed for one person only. The operator places the tips of his forefingers against the spectator's eyelids. Feeling both fingers, the spectator knows that the operator's hands are occupied, and he is greatly astonished when he feels a hand tap him on the head or brush his shoulder. The operator immediately removes his fingers, and the spectator is free to look around in an effort to discover whence came the spirit touch.

The method is interesting. As soon as the spectator shuts his eyes, to receive the tips of the operator's extended fingers, the operator merely extends the first two fingers of one hand, placing one finger tip on each of the sitter's eyelids. This leaves one of the operator's hands free for action. The operator should have both hands close together when he removes his fingers from the person's eyelids.

The trick is simple enough; but it is no simpler than numerous methods of release that have been adopted by fraudulent mediums, past and present. Simplicity is the keynote of some of the most effective tricks, whether they are performed fairly by magicians or unfairly by fakers.

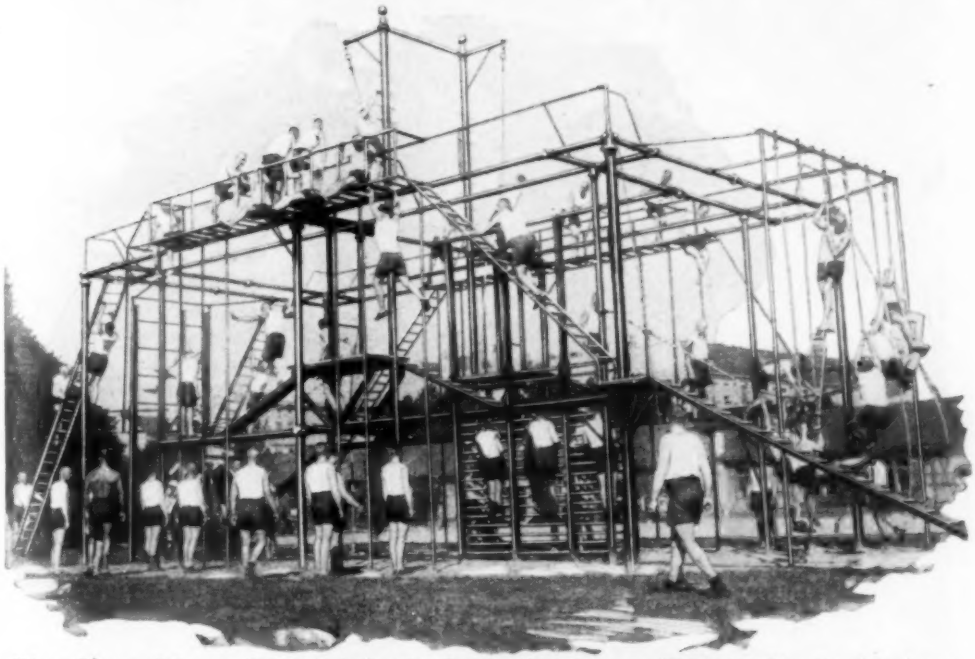
MOTOR SLED RUN BY COGWHEEL NINETEEN MILES AN HOUR

Winter sport for the person who likes to drive a motor is afforded in a sled introduced in Germany. It is propelled by a cogwheel turned by a one and one-half horsepower gasoline motor. The wheel is also used for steering. A speed of nineteen miles an hour is attained on level surfaces when the snow is in the right condition. On down grades, the drivewheel can be disconnected and the sled coasts. An

Motor Sled with Footrests Heated by Gases from the Engine; the Latest Unit for Winter Sports

additional feature is that the footrests are heated by exhaust gases from the engine.

"IRON PHILIP" HELPS TRAIN GERMAN POLICE



Where German Policemen Keep Physically Fit; Outdoor Gymnasium at Which 100 Men Can Exercise at One Time and Perform a Wide Variety of Stunts

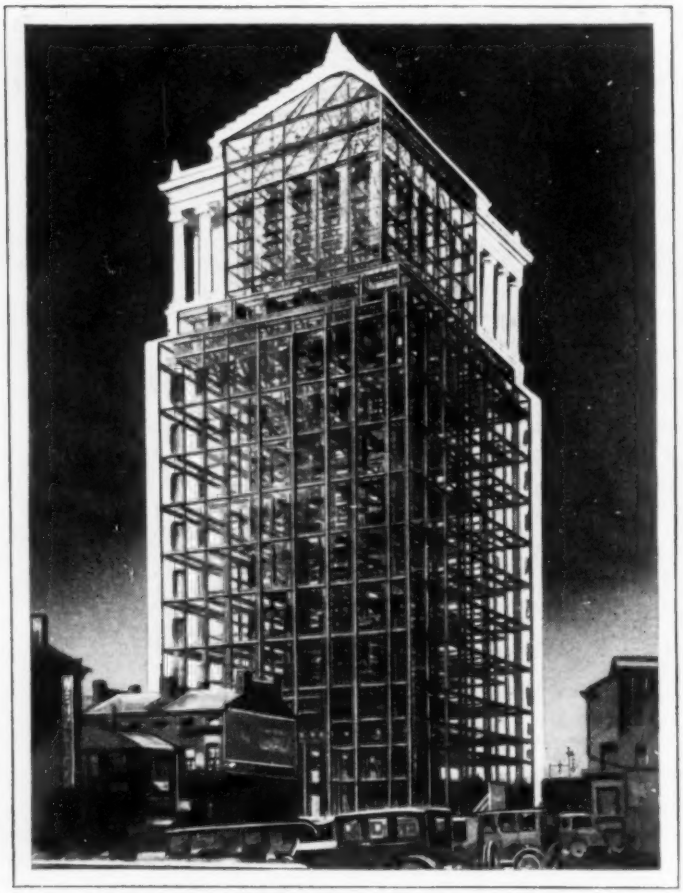
One hundred men can exercise at the same time on an outdoor gymnasium unit installed for the Berlin, Germany, police force. It has horizontal bars, trapezes, ladders, swinging rings and other attachments and is well fitted for individual or group work. Stanchly constructed of metal, the gym has been named "Iron Philip" by members of the department.

TIDES IN SURFACE OF EARTH LIKE THOSE OF OCEAN

Like the seas, the earth's crust rises and falls in tides as a result of the attraction of the sun and moon, Dr. Walter D. Lambert, scientist of the coast and geodetic survey, asserts. These movements have never been measured because instruments for the task have not yet been devised and complicated computations are involved, but scholars have established the existence of such movements beyond all reasonable doubt, he declares. These earth tides are affected by the ocean tides, according to Dr. Lambert, who says that there is probably no place on earth so remote from the seas that the effect of the ocean tides is not registered in the similar movements of the world's crust. It has been shown that the tides in the Atlantic have an appreciable effect at Williams Bay, Wis., about 800 miles away.

STEEL GLOVE FOR BUTCHERS REDUCES HAND INJURIES

Designed especially for packing-house butchers, a glove of steel mesh protects the hand that does not wield the knife. The guard is the invention of a physician who was called upon to dress the injuries of men working in a large packing plant. As many as thirty cut hands daily led him to design the glove, which has proved effective in preventing injuries of that kind and yet does not interfere with work.



Composite Photograph Which Produces X-Ray Effect, Showing Steel Skeleton of the New St. Louis Courthouse

"X-RAY" PHOTO OF SKYSCRAPER SHOWS ITS STRUCTURE

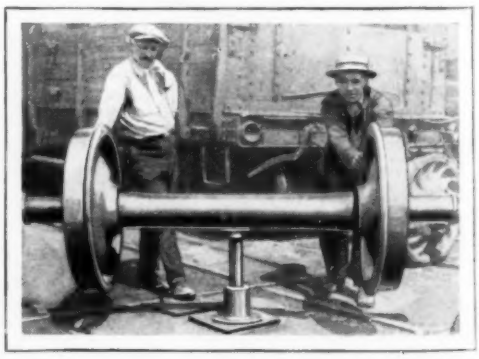
By means of a composite photograph, producing the effect of an X-ray, an interesting study has been made of the new $5,000,000 courthouse in St. Louis, Mo. The result was obtained by making a photograph of the steel work and printing it through another photo of the building itself as it appeared in a four-foot plaster model. The double exposure shows at a glance how much of the building is steel and how much is stone and reveals other data concerning its construction. The courthouse is nearly 380 feet high and has the equivalent of thirty-three stories. The architects combined classical forms with the lines of the modern skyscraper in achieving the design.

COAL PULVERIZER CUTS STEAMERS' FUEL COST

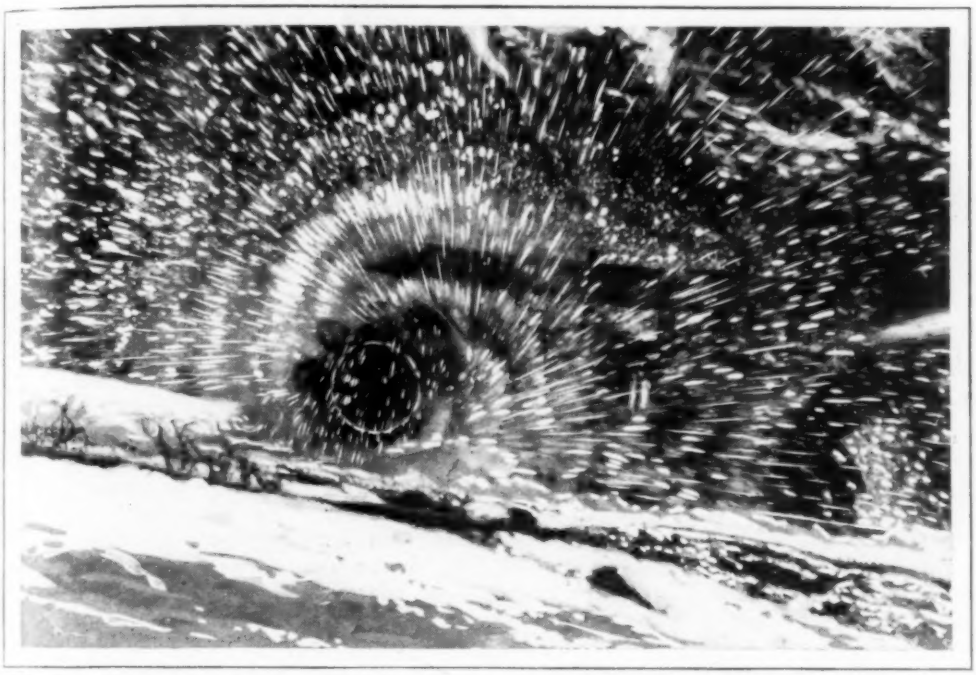
Marked reduction of the fuel costs on steamers is predicted with a special coal pulverizer for marine use. The outfit not only crushes the fuel, but forces it into the furnaces with compressed air, eliminating the necessity of firing by hand. Since the powdered coal has greater heating efficiency, there is an added advantage besides the saving in labor.

AIR JACK SPEEDS TRANSFER OF CAR WHEELS

Time and labor are saved at the Pennsylvania yards in Chicago in handling car wheels with a compressed-air jack. It is placed in the center of the junction of two tracks, one leading to the shop and the other to the repair yards. As the wheels come from the cars, they are raised for easy transfer to either track simply by depressing a pedal. To lower them, another pedal is depressed. The top of the jack is shaped to keep the axle from falling off.



Air-Operated Jack Which Raises Car Wheels So They Can Be Shifted to Different Tracks



Pinwheels in Snow! Rotary Plow Cutting Its Way through Drifts up Pikes-Peak Motor Road; in Places Surveys Had to Be Made to Find the Hidden Highway

FIGHTING SNOW ON PIKES PEAK SIMPLIFIED BY TRACTORS

Tractors and rotary plows that cut their way through deep drifts and hurl the snow far to either side, have been successfully enlisted in the annual battle to clear the toll road up Pikes Peak. Where from thirty-five to forty days were once required for the work, it is now done in seven and with fewer men. The highway twists and winds about the mountain, affording many "pockets" for the snow to accumulate, and, in places, the road is entirely obscured so that maps and surveys are necessary to guide the workers. Should their machines stray from the right course, equipment and men might be tumbled down the steep peak. Because of the intense cold at altitudes of 13,000 feet and more, special precautions have to be taken to prevent the water in the tractor radiators from freezing. Drifts eighteen feet high are encountered in many places.

MODEL PLANE FLIES BACKWARD OR POISES IN AIR

To demonstrate a helicopter plane he expects to finish in serviceable size, a California inventor has prepared a working model with a one and one-quarter horsepower motor to operate the blades. The model is said to fly straight up or down, backward as well as forward and can remain stationary for a time while aloft. The large-size ship will have a wing spread of thirty-four feet and will be driven by a 600-horsepower motor.

Model Helicopter Plane Which Flies Up or Down and Can Remain Stationary for a Time in Air

¶ Coins dating from about 700 B. C., have been unearthed.

An Exciting Game on the Indoor Diamond; the Ball Is Rolled Down the Incline to Opposing Player at Swivel Bat

BASEBALL GAME PLAYED IN BOX LATEST INDOOR SPORT

Devised originally for the amusement of disabled war veterans, an indoor baseball game is becoming popular among others. It is said to afford some of the thrills of the real game, requires considerable skill and is interesting to the spectators as well as to the players. A tiny ball is rolled down an incline, the object being to have it hit the backstop and so score a strike on the opposing player, who is at bat with a tiny small stick adjusted to a swivel. He endeavors to hit the ball with this miniature bat, to score a hit, homerun or other credit, according to the place where the ball lands.

PAPER PRODUCT SETTLES DUST ON SWEDISH ROADS

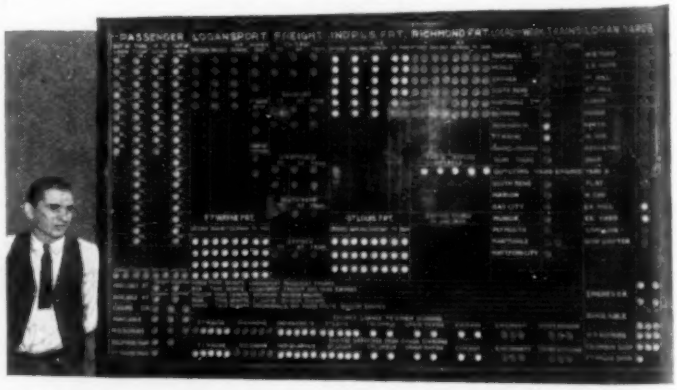
Use has been found in Sweden for one of the by-products of the paper mills. It is sulphite lye, that heretofore has gone to waste, but is now being employed to sprinkle the roads for settling the dust. The material, which is mixed with other substances for this purpose, also reduces maintenance costs on the roads and increases their surface durability, according to reports.

FOODS REPRESENT ONLY FRACTION OF SUN'S HEAT

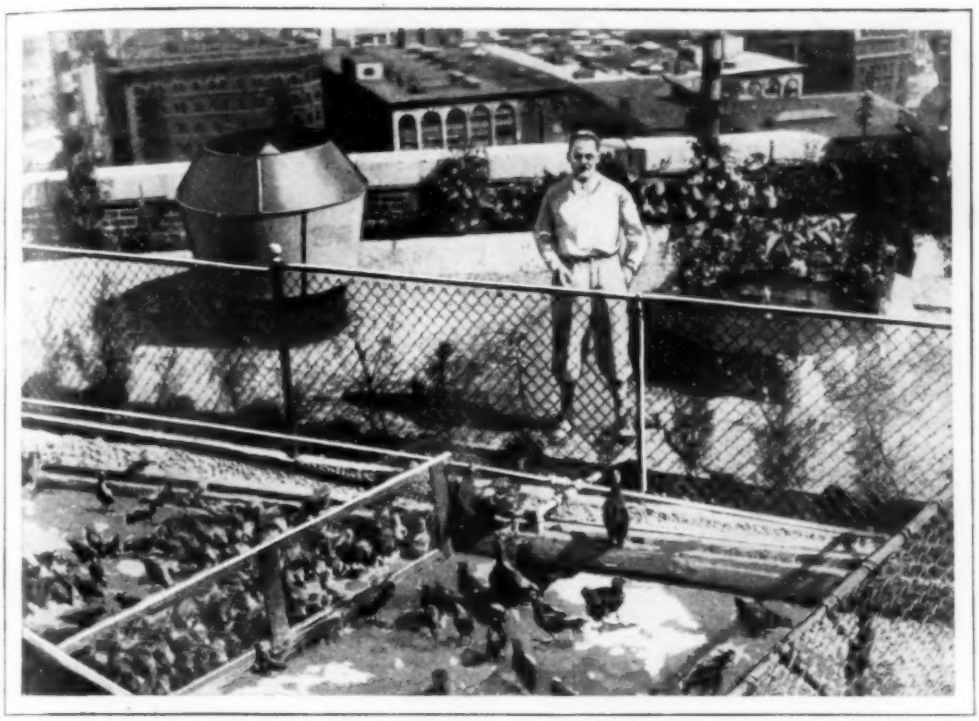
To release as much energy as is contained in the sunlight captured annually through the production of plant foods, it would be necessary to burn about 8,900 times as much coal as the whole world produces in a year, scientists estimate. But of this huge total, the human race uses less than two-tenths of one per cent, according to Dr. John M. Arthur, of the Boyce Thompson Institute for plant research. Human beings are dependent on the process by which the plant uses the sunlight to produce energy in the form of various foods, of which each person consumes about 2,000 calories every day.

ENGINE-LOCATION BOARD AIDS RAILROAD EFFICIENCY

Devised by an engine-house clerk, a location board tells at a glance where locomotives on the division are, whether in shops, in service, borrowed or available for duty. It saves consulting more complicated records and is easy to operate, metal-bound tags being placed on hooks to indicate the status of the engines. It saves time and aids the locomotive dispatcher in making accurate reports and quick assignments.



Keeping Track of the Railroad's Engines; This Wall Chart Shows Where Every Locomotive Can Be Found



Happy and Thriving Although They Have Never Been on the Ground; Chickens on Roof Farm of Providence, R. I., Hotel; They Enjoy Plenty of Fresh Air and Sunshine

CHICKEN FARM ON CITY ROOF SERVES BIG HOTEL

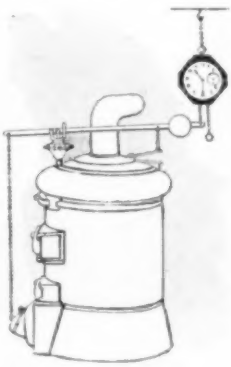
The chickens shown in this illustration have never seen the ground, and probably never will, for they have been raised on an aerial farm on top of a large hotel building in Providence, R. I. They have pens, watering fountains, and dirt to scratch in, just as their country cousins have, and seem to thrive on their elevated location. Besides making use of space that otherwise would go to waste, the plan assures the hotel fresh poultry and eggs.

DWARF TREES ONE FOOT HIGH SUBSTITUTE FOR BRIAR

A possible substitute for briar, in the manufacture of pipes and other articles, is reported to have been found in a peculiar wood that grows in Africa. The trees sometimes have trunks four feet in diameter but are not more than one foot high. There are but two leaves to a tree, and these attain a length of six feet and a breadth of two feet. The roots are tough and of a beautiful shade. The wood is successfully worked in a lathe and does not easily fracture, so that waste is reduced to a minimum.

CLOCK STARTS UP THE FURNACE ON COLD MORNINGS

Discomforts of arising on cold mornings to start the furnace fire are avoided with a clock arrangement that opens the drafts at any time specified. It is easily adjusted to any type of furnace and functions chiefly by releasing a weight at a certain predetermined time, to lift the drafts. This is done gradually to prevent damage to castings. The clock is set like an alarm and is specially constructed for service in a dusty cellar.



It's a Simple

Harriet Hodgini, Twelve-Year-Old Daughter of the Circus, Shows Her Skill at Riding High School Horses

By EARL CHAPIN MAY

THE children of the modern circus family, the budding riders, aerialists and acrobats of the future, lead simple, sane and happy lives.

These youngsters of the tights, spangles and tented world come, almost always, from circus stock. They are "born into the business," to use a circus phrase, and are raised as tenderly as any sons or daughters of college professors or merchant princes. About the only difference between the way they are brought up and the way the children of "towners" or "gillipins" are raised is that "trouper" children are taught the virtues and rewards of discipline. Their lives are circumscribed by duties. These little troupers learn from infancy to respect their parents and their wishes or commands, which sets them apart from most offspring of non-trouping stock. But they take a wholesome delight in circus life. They rejoice in it. Why shouldn't they? It's one long life of camping out.

Spring has come and with it a tented city grows up some morning on the grass-grown field that is your local circus grounds. If you are among the hundreds of towners who are early birds, you are in your railroad yards in time to see the Nelson family descend the steps of a yellow Pullman car, which is part of a long and heavily loaded circus train.

Mother and father Nelson first appear and are followed by seven children ranging from Rosina, aged thirty, to little Paul, in his fourteenth year. As they walk or ride in taxi or trolley car from the train to circus grounds, you'd hardly guess that the motherly looking

Life for Circus Children

The Cinderella Story, Starring a Circus Child, and Bertie Hodgini Taking a Ballet Lesson

woman in gingham dress and the kindly man in plain gray suit are convoying a group of the world's most famous acrobats. You might not notice them at all. Certainly you would never recognize them as circus people if you did not see them in connection with the gaudy train or tall white tents.

Once on the lot, the younger ones may romp a bit. They may play leapfrog among themselves. But they pay no attention to those who do not belong to their fraternity. Their own company satisfies them. They hunger for just one thing more—breakfast in the cookhouse or circus tent. As each Nelson enters the long canvas room, above which a small flag is flying to indicate that food is being served, he pauses to purchase from the circus steward a quart of milk for his own use. This extra is ordered by the parent Nelsons three times each day, for breakfast, noon-day lunch or dinner and five-o'clock supper. Fruit, cereals, jam, bread, butter and a little fish complete the daily menu.

Between breakfast and dinner the Nelsons visit with their circus friends, clean and repair wardrobes and, occasionally, practice some new trick. Then comes a session of lessons with mother Nelson as teacher. This time may be devoted to mathematics, physics, chemistry or almost any subject except geography, for, as the

can heat our private dressing tent if I think best."

Among the well-known circus families are the Hobsons, riders of the first rank. Mr. and Mrs. Homer Hobson, Sr., have, like the Nelsons, been featured in the circus ring for more than forty years, but you'd never guess it unless the family chieftain told you so. Homer Hobson, Jr., and Herbert, his youngest brother, have been trouping since infancy. In one of the Hobson riding acts, young Homer, while clowning it, is dragged face downward around the ring clinging to the tail of a galloping horse, which frequently kicks cinders or gravel into the clowning equestrian's mouth. I've seen the boy's lips bleed many times, but he thrives on rough work of that kind. You would hardly recognize in

Nelsons have been traveling with some circus since infancy and in almost any year can show a mileage of at least 20,000, they have learned their geography from contact with many countries in many climes. Like other troupers, they work twice each weekday, but, all told, are in the circus ring less than thirty minutes daily, including the matinee and night performance.

Of course, there are thorns along the circus path. I've seen the Nelson girls, clad only in low bodices and silk tights, stand, unprotected from chilling rain, while awaiting their turns to enter the big top and do their stunts. But the weather did not bother them.

"They've lived outdoors most of their lives," the mother proclaims proudly. "They take a cold sponge bath every day. Of course, they get plenty of exercise, and all the food that's good for them. There are plenty of blankets in their berths and I

Madge Fuller as an Elephant Trainer, Georges Carpentier with a Circus Daughter, and Bertie Hodgini Trying a Clown Role

the pink-faced, sturdy lad the buffoon who "steps off" a racing "finish" horse. The "step-off" is a difficult trick. While one foot is on the hindpart of the moving horse, the other foot must touch the ground. But the second foot must follow rapidly, or it would be painful for the Hobson boy.

Herbert, who works with Homer, Jr., made up as a girl, also doubles with the other Hobsons in an Indian riding act. Herbert likes that Indian "double" best, because he has a strong leaning toward the Wild West stuff.

For several seasons, when not in school, he has practiced cowboy tricks, until he has become so proficient with the lariat that he does rope spinning in the circus after-show or concert as a product of our western plains, although the Hobsons have long been legal residents of Chicago's west side. Which shows that one professional boy regards circusing as a bully game.

The Two Hodgini Children in Some of Their Favorite Playtime Stunts, Harriet as a Cowgirl and Bertie as Equestrienne and Clown

Performers take their work seriously, yet they look upon their work as play. The biggest event in the Sells-Floto show during the season of 1925 was one in which outsiders had no part. They didn't even look in on it because it was a burlesque on the big-top performance, given in the backyard by riders, acrobats, clowns, jugglers, contortionists and aerialists. Acrobats came out on hobby horses. Aerialists "took off" the so-called funny clowns. Clowns made fun of the aerialists, and the hundreds of circus executives, musicians and laboring men, who paid their money to see the mimic show, had the time of their lives, and helped create a fund for a performer laid up in a hospital. Birthdays and weddings are celebrated in the backyard, and the clown band often stages its own impromptu shows.

The discipline which young circus people accept as the most important part of

the daily life doesn't spoil the fun for them. Although they must be through their breakfast by nine o'clock and, on smaller shows, be ready for parade when the second bugle blows, at ten or thereabouts, and must be through their dinner and supper before the cookhouse flag falls, because when that flag falls it means that meals are no longer being served; although they must sleep in the same berths each night, usually doubling up with some one of their sex; although they must sit on the same hard plank in the same place at the same table at each meal; although all their circus and street wardrobe must be in the same little square-topped trunk in the same place, close to other trunks, in the dressing room each day, and everything must be packed and unpacked methodically, and although they must never be late a second or disobey or ignore any order referring to their appearance in the ring, they lead a simple, easy life.

Not only do they get plenty of fresh food and air and just enough exercise to keep them hard and fit, they also are protected by the traditions of the circus lot. Even on the wettest days, when wind and weather are against all trouper folks and the canvasmen are struggling with hostile elements, rough language seldom meets their ears. They are taught to take care of themselves whenever possible. They are not pampered or petted. But day in and out, the circus family is never separated. If the parents do not keep their children in plain sight, they know exactly where those children are.

The circus company is one great family and some of its members are always close at hand. The young folks have no opportunity to take long rides in motor cars by themselves. Such rides as they take between the lot and circus train are in the company of other troupers. So circus parents do not wonder where Tom or Sally may be at night. The children are either in or near the lighted tents, on the way to or in the circus train.

This sounds as though young circus lives were pretty limited. They are, but I've never heard a word of discontent. Sometimes Harriet Hodgini, from the wisdom of her twelfth year, will grumble because she is not allowed another ice-cream cone. Bertie, her ten-year-old brother, may look vainly at a lollypop. But fatness is fatal in the circus business, unless one wants to be a sideshow freak. They are trained to restrain themselves even when they are sorely tempted by the circus steward.

All Ready for the Grand Entry in the Opening Spectacle; the Circus Families Gather in Gorgeous Costumes, Ranging from Oriental Splendor to the White Paint of the Clowns

Last Fourth of July, at New Bedford, Mass., Harriet and Bertie sat through a dinner which included sweet relish, Little Neck cocktail, celery, young onions, radishes, chicken gumbo soup, broiled salmon with tartar sauce, young Vermont turkey with oyster dressing and cranberry sauce, baked Virginia ham and corn fritters, new potatoes in cream, green peas, combination salad, asparagus tips on toast, strawberry shortcake, watermelon, ice cream, salted nuts and coffee. Yet Harriet and Bertie did not sample half of it. Meats and sweets are seldom given them because they are destined to follow their mother and father in the ring.

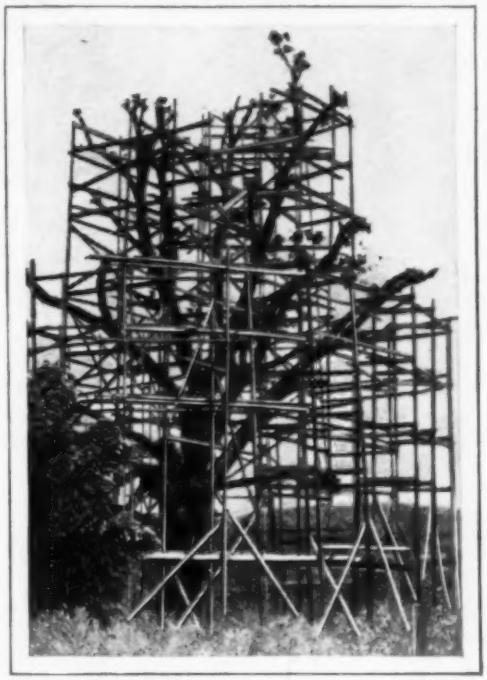
They have been preparing for their careers since babyhood. They are skillful school riders now. But they look long years ahead. Some day they are going to be principal riders. A principal rider is one who stands, pirouettes and somersaults on the rosined back of a loping steed. As that steed goes round and round the ring and the circus band plays its fastest tune, the rider kisses his or her hand to the thousands of applauding towners.

HAND SPRAYER FOR LACQUERING SAVES USING BRUSH

Special nozzle adjustments in a hand sprayer now on the market are said to adapt the instrument to the successful application of lacquer to a wide variety of surfaces, resulting in a better job than could be done with a brush and at a saving in time. By taking care to have the liquid of the proper consistency and holding the sprayer at an angle of about forty-five degrees to the face of the work, spots and runs can be avoided, it is asserted. The tool is easily kept in order and, when not in use, is held in an upright position so that the contents will not spill.

¶The United States has one-third of the world's telegraph lines.

CHANGE FRUIT OF WALNUT TREE BY GRAFTING OPERATION

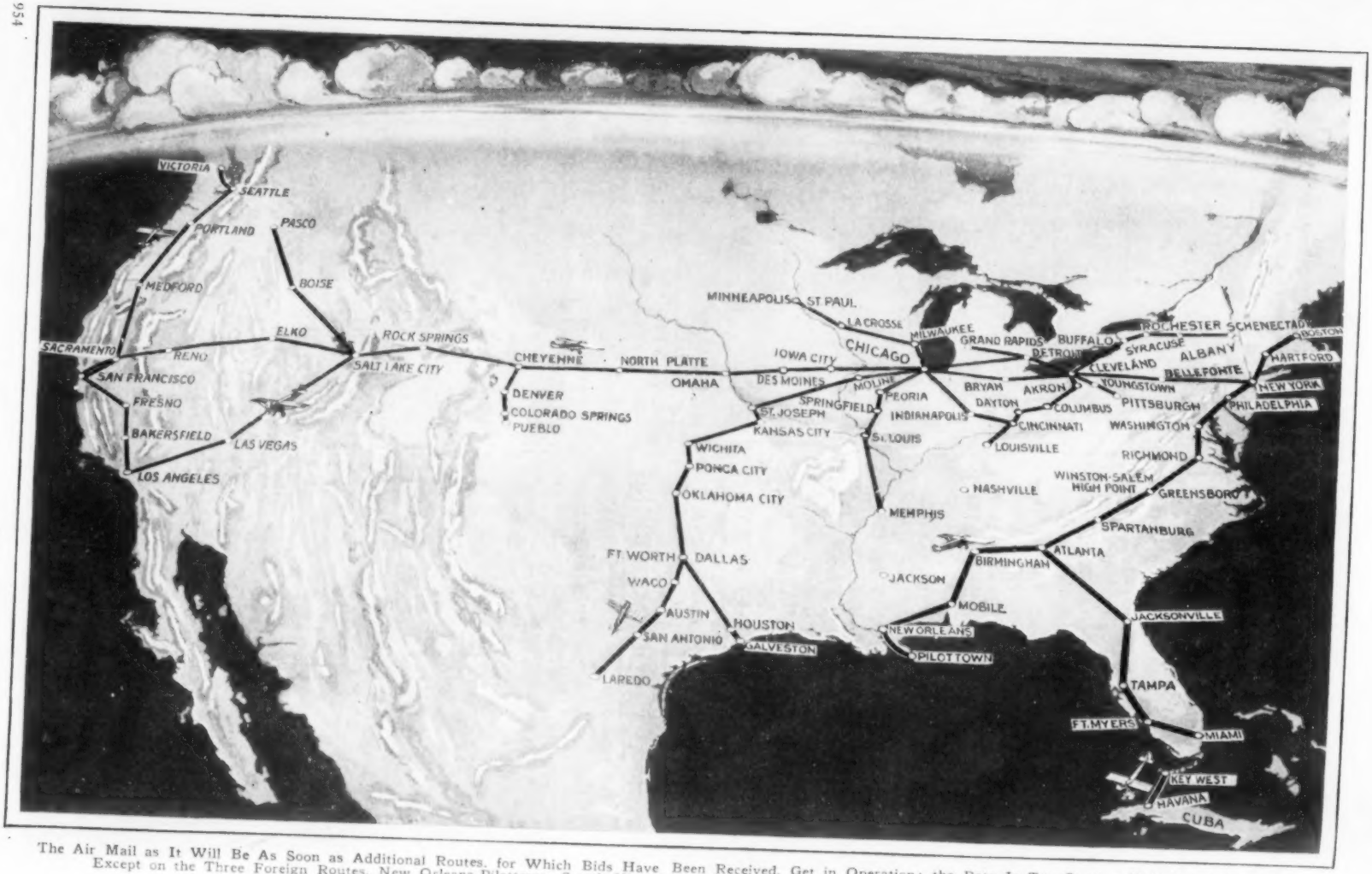


Black-Walnut Tree Transformed into Bearer of the English Variety and Scaffold Used in Grafting

Although it has yielded black walnuts for many years, a huge tree in California will produce only the English variety from now on, for it has been altered by one of the most extensive grafting operations on record. Tree surgeons erected a huge scaffolding about the limbs in order to reach all parts of them. The tree is more than 100 years old and, in a few seasons, it is expected to produce nearly a ton of English walnuts.

AUTO TRUCK WHEEL OF RUBBER REDUCES TIRE EXPENSE

Auto truck wheels made of compressed rubber have been introduced to replace the usual disk and tire type. They are resilient and noiseless, do less damage to surfaces and may be obtained in varying degrees of hardness, depending upon the maximum expected load. Maintenance is low, as there are no punctures, retreading costs or breakages, and the wheels are unaffected by hot, cold or damp climates, it is asserted.



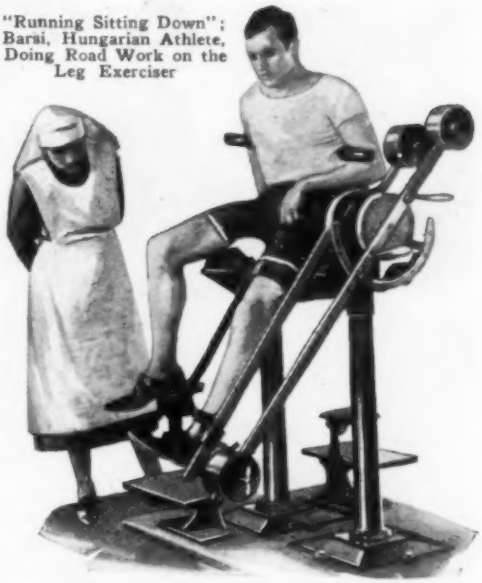
The Air Mail as It Will Be As Soon as Additional Routes, for Which Bids Have Been Received, Get in Operation; the Rate Is Ten Cents a Half Ounce Anywhere, Except on the Three Foreign Routes, New Orleans-Pilottown, Seattle-Victoria and Key West-Havana, Where Regular Two-Cent Postage Applies

AIR MAIL'S AMAZING GROWTH SETS AVIATION RECORD

With the greatest air-mail and aerial-express system in the world, the United States has quietly taken the lead in self-supporting commercial aviation, so quietly that few people realize the extent of the air lines in actual operation. While European countries, with their government-subsidized air lines, are still ahead in passenger carrying, the United States is rapidly forging to the front in this field, too, since the mail lines built up by the post office department have been turned over to private operation. For a fare of $200, it is now possible to go from Chicago to San Francisco by air in twenty hours, instead of three days by train, and shorter passenger routes are in operation on many of the other air lines. The elimination of the old zone system, with various rates for different sections, has done much to popularize the air mail, as it is no longer necessary to study a map before sticking the stamp on an air letter. The new rate is ten cents a half ounce, regardless of where the letter is going. Air letters do not require an extra two-cent stamp, as is the case for special-delivery mail, the ten cents being the only charge. While the actual flying has been turned over to private contractors, who furnish their own planes and landing fields and carry the mail at a fixed price per pound, the government system of night-flying beacon lights has been taken over by the department of commerce, and placed under the lighthouse service, which guards ships at sea and ships over land now. The lights are being extended on new mail routes, to permit night flying, and eventually every part of the country will have its blazing trail of beacons to mark the main air routes. The department also is developing radio-compass beacons, and already has installed the first one at the Bellefonte, Pa., field, the center of the worst flying zone in the country. While the domestic air mail has been growing apace, the post office recently let a contract for its third foreign mail route, a ninety-mile jump from Key West to Havana.

¶Some kinds of goldenrod are cultivated as garden flowers.

"Running Sitting Down"; Barsi, Hungarian Athlete, Doing Road Work on the Leg Exerciser



LEG EXERCISER KEEPS RUNNER IN TRIM FOR RACES

To strengthen his leg muscles and keep in training for the races, Barsi, a Hungarian middle-distance runner, practices on a special exerciser. It permits the operator to stand in approximate running position and manipulate pedals which turn weights to give the necessary resistance. The outfit is especially useful when the weather does not permit outdoor training.

TIRE-CASING SPREADER HELPS PREVENT PUNCTURES

Thorough examination of the inside of the auto-tire casing and removal of small articles, such as tacks and nail points, likely to cause puncture, can easily be accomplished with a simply operated spreader now on the market. It forces the sides of the casing far apart, and the entire surface is exposed, by means of a corrugated roller and two disks, as the casing is rotated with a hand lever.

Placing the Refrigerating Unit in Cabinet, and Closer View, Showing the Two Balls and Cube Freezer

ICE IS MADE WITH COOKSTOVE FOR REFRIGERATING

Artificial refrigeration is now available even to homes that are not supplied with electricity in a recently introduced unit, operated on almost any kind of a stove. It consists principally of two large balls, connected by a peculiarly bent tube. A refrigerating liquid, introduced into one of the balls, is heated on the stove while the other is submerged in a tub of water. The heat evaporates a portion of the liquid which passes into the cold ball and condenses. A small whistle warns when the heating has been continued long enough; the unit is then lifted off the fire, the hot ball submerged a few moments in water and the outfit placed in the refrigerating cabinet. The liquid in the cold ball has started to evaporate and pass slowly back into the other chamber, the process chilling the cold ball to a temperature of zero or below, it is said. This action is continued and is said to maintain a cold, dry temperature for twenty-four to thirty-six hours, depending upon the outside atmosphere. An ice tray is supplied with the unit and is placed inside the cold ball for freezing cubes for salads, deserts or cooling liquids.

CHANGE AUTO INTO FIRE ENGINE TO HELP SAVE FORESTS

By the addition of high and low-pressure pumps, a small automobile has been changed into an efficient fire engine for fighting blazes in the California forests. It carries 500 feet of hose, tools and other equipment and can hurl a two-and-one-half-inch stream of water eighty feet, at a pressure of eighty pounds to the square inch. The low-pressure pump is employed in forcing water to the other from a considerable distance, a feature that many other auto units have not had. This is important, for often the available source of water is far from the actual scene of the fire. Both pumps are portable and quickly taken from the auto for use in any convenient place. The car is fitted with a variable-gear axle and, since it can be turned within a short radius, it is especially adapted to service on narrow, winding mountain roads. As many fires occur near the highways, owing to carelessness of campers, it is believed that the auto unit will be especially effective in curbing blazes before they have a dangerous start. In a recent test, the converted car beat regular fire-fighting equipment to a blaze and had water on the fire within a short time, although the supply was half a mile up the road. A ditch and the low-pressure pump solved the problem.

Pump in Action on Front of Auto, Which Has Been Converted into Fire Engine to Guard Forests

¶A five-speed outboard motor is being built for small boats.

PROTECTING THE SHORE ENDS OF LATEST CABLE

Completing the "Cable Handclasp" between England and Belgium; Placing the Shore End of the Big Line; Special Coverings Have Been Used to Protect the Wires from Corrosion

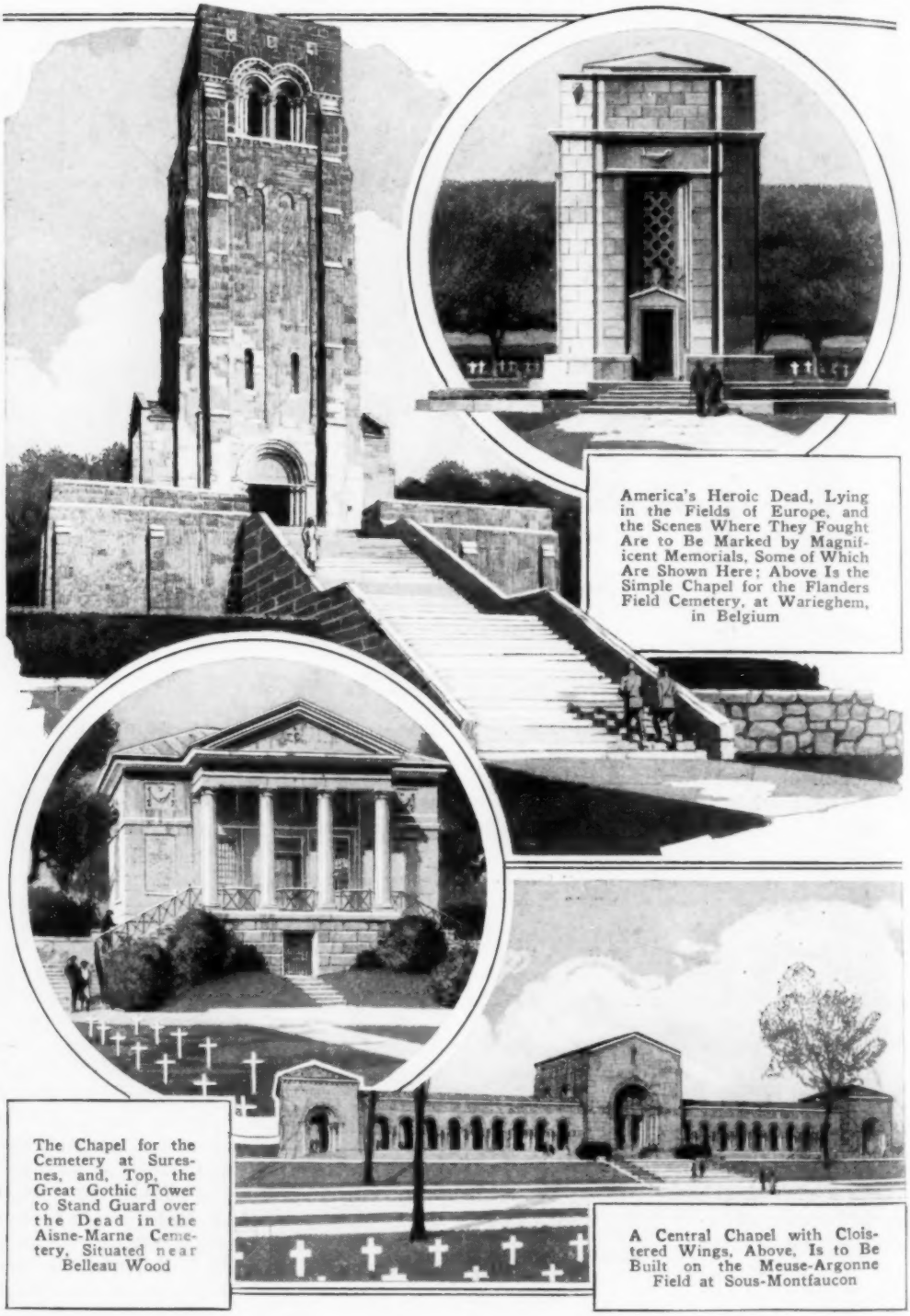
A new link between England and Belgium, an iron handclasp across the English channel, has been completed recently. It is the British post-office cable, an international bond that will mean better and quicker communication between these two countries. Every new cable contains improvements designed to make it better than its predecessors. If corrosion damages a cable, it is very expensive to fish up the ends and repair them. In fact, any kind of work would be difficult, because of the strong current in the English channel and the prevalent stormy weather. The worst corrosion usually takes place on the shore ends of the cable because of decomposed matter near the surface of the water. Even the thick composition coating used does not always resist such severe conditions, and cables sheathed with ordinary steel wire have failed quickly. So it was decided to use rust-resisting pure iron to cover this latest cable.

AIR-MAIL LETTERS IDENTIFIED WITH LABEL TAPE

For easy identification of letters intended for the air mail, a special label tape carried in a handy roll has been devised. The tape comes as a continuous strip, gummed on one side, and the holder is designed to prevent the edges from curling up and for removing the tape with a slight movement of the thumb. Each label is detached at a perforation in the strip.

Simple Means of Identifying the Letter for Air Mails; Applying Tape from Holder

BATTLE MONUMENTS TO AMERICAN HEROES

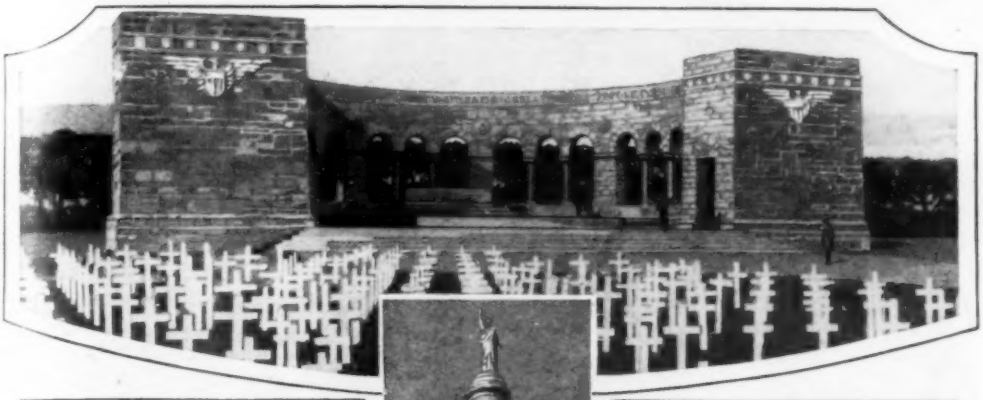


America's Heroic Dead, Lying in the Fields of Europe, and the Scenes Where They Fought Are to Be Marked by Magnificent Memorials, Some of Which Are Shown Here; Above Is the Simple Chapel for the Flanders Field Cemetery, at Warieghem, in Belgium

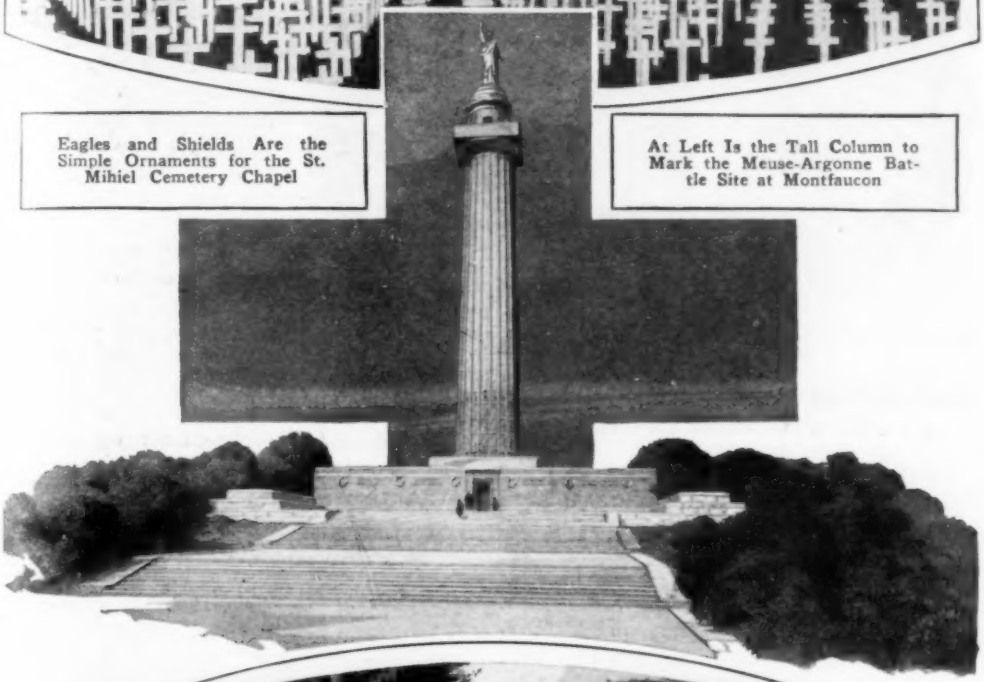
The Chapel for the Cemetery at Suresnes, and, Top, the Great Gothic Tower to Stand Guard over the Dead in the Aisne-Marne Cemetery, Situated near Belleau Wood

A Central Chapel with Cloistered Wings, Above, Is to Be Built on the Meuse-Argonne Field at Sous-Montfaucon

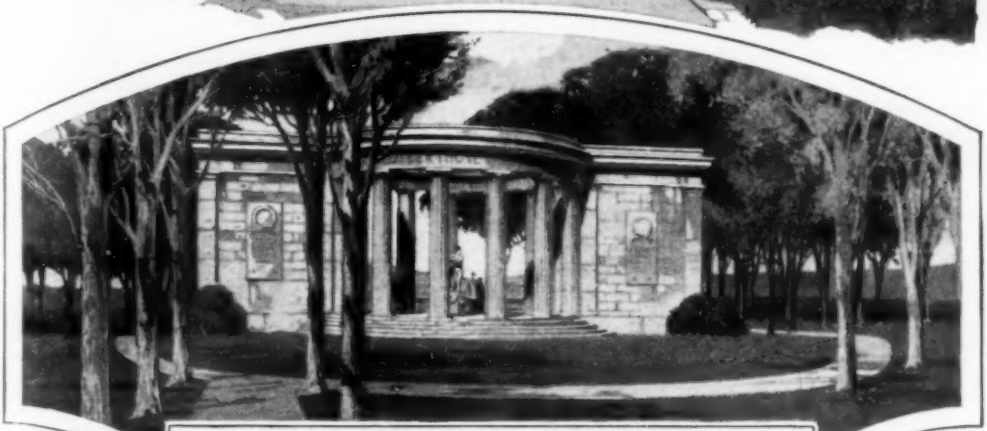
TO MARK MAJOR ENGAGEMENTS IN FRANCE



Eagles and Shields Are the Simple Ornaments for the St. Mihiel Cemetery Chapel



At Left Is the Tall Column to Mark the Meuse-Argonne Battle Site at Montfaucon



A Circular Colonnade with Chapel Wings Has Been Planned by Gen. Pershing's Monument Commission for the Oise-Aisne Cemetery near Fere-en-Tardenois

Superstition and Modern Advertising Meet on Chinese Stone Elephant; Ming Tomb Figure Is Billboard and Shrine

STONE ELEPHANT AS BILLBOARD SHOWS CHANGES IN CHINA

That modern China is recognizing the importance of advertising, even to the extent of trampling on the traditions of the past, is shown by the accompanying illustration. The nationalists have used a stone elephant near the Ming tombs as a billboard on which to display posters urging citizens to put down communism and attend the nationalist-party conference. In striking contrast to this modern note are the stones on the back of the elephant. They were tossed there by women following an ancient superstition, signifying that, if the stone lodged on the monument, good luck would reward the thrower and her next child would be a boy, but if it fell off, a girl child would be born.

GOLD IS BROUGHT BY PLANES FROM SIBERIAN FIELDS

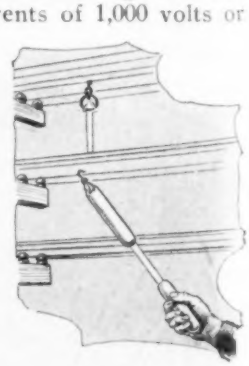
Gold is delivered in a few hours instead of several days from the rich Aldan fields of Siberia, by airplanes. The mines are several days' travel from a railroad, but the airplane has stimulated development.

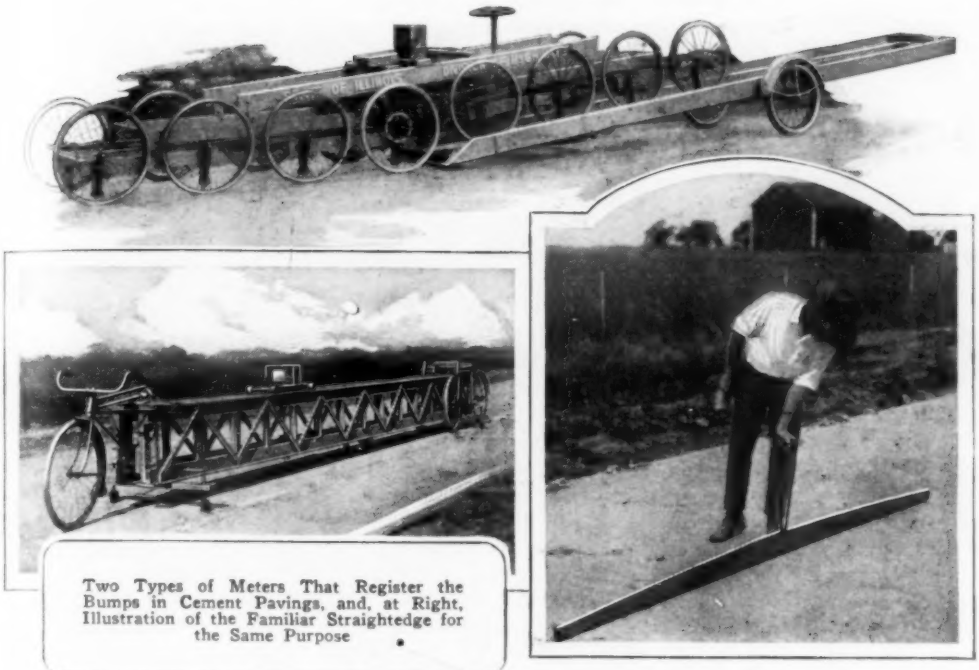
"PADDED CELL" FOR MACHINERY

A huge flywheel is spinning at terrific rate. There is the sudden crash of hurtling metal, and one side of the big wheel collapses and is thrown against the wall. Anyone standing in the path of the missile would have been killed or severely maimed, but the men who have been watching the wheel are safely outside, peering through telescopes, and the concrete walls that guard them from the spinning giant are nine feet thick. This is a test chamber or "padded cell," an English electric company uses for trying out flywheels and other machine parts subjected to high speeds. Fast camera lenses, at guarded openings in the walls, record the results of the tests which would be impossible were it not for the safety room.

HIGH-VOLTAGE TESTER GUARDS AGAINST ACCIDENTS

Electrical workers handling installations involving currents of 1,000 volts or more, are provided with a tester intended to reveal parts of equipment still connected to the high voltage with a minimum of danger and great certainty. It consists chiefly of an indicator filled with neon gas which glows brightly when electric current passes through it. On voltages of 3,000 or more, it registers simply by being placed in the electrostatic field, without contact with the wire. For use on parts difficult to reach, it is mounted on a pole.





Two Types of Meters That Register the Bumps in Cement Pavings, and, at Right, Illustration of the Familiar Straightedge for the Same Purpose

METER THAT MEASURES BUMPS INSURES SMOOTHER ROADS

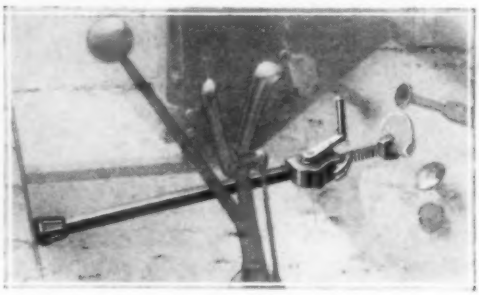
To determine the smoothness of concrete roads, the bureau of standards has developed a special measuring instrument which writes an accurate record of the bumps as it moves along the highway. The outfit has sixteen wheels, each adjusted to react to the irregularities on the surface in such a way that the motion is transmitted to the delicate recording apparatus.

MAGIC METAL LIKE ALUMINUM TO IMPROVE AIRPLANES

Airship frames and automobile pistons of beryllium, or its alloys, a metal about a third lighter than aluminum and much harder, may be introduced in the near future, experts predict. The substance has been known for a long time but, until recently, its production in quantities large enough to be industrially practical has been impossible because of inadequate refining methods. In many ways, beryllium is suited to the service of man. It offers high resistance to corrosion, is four times as elastic as aluminum and expands under the influence of heat at about the same rate as cast iron. This property makes it peculiarly adapted to use in engine pistons. Some of the difficulties of the present types of light pistons arise from the fact that they expand at a different rate from that of the iron cylinders in which they are inclosed.

AUTO-PEDAL DEPRESSOR AIDS IN BRAKE ADJUSTMENTS

The need of an extra man is eliminated in making adjustments of the auto's brake, clutch and stop light with a depressor for the pedal. It fits against the edge of the front seat and holds the pedal in a steady grip at unvarying pressure.



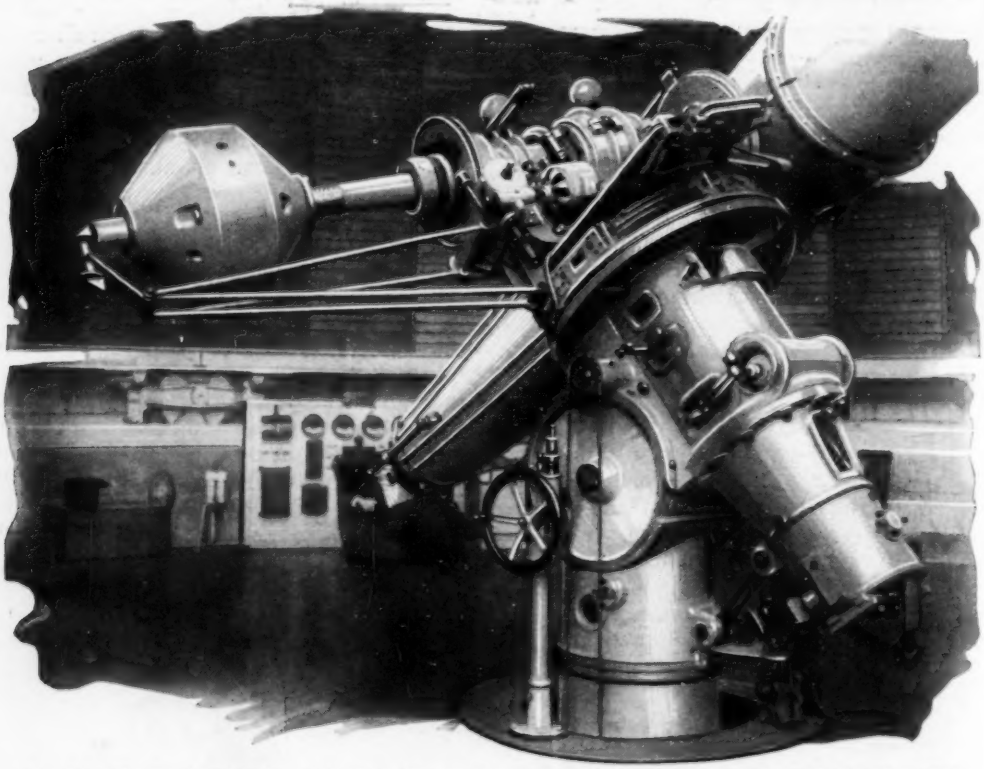
Brake Depressor Attached to the Pedal Showing How It Serves as a Helper in Making Adjustments

Where a PINT

"A PINT'S a pound the world around," says an old proverb, but the author of it had never heard of a star, which astronomers have weighed and measured, where a pint weighs twenty-five tons.

The star is one part of the twin body which we know as Sirius, the dog star. It is so far away that it appears to the eye as a single star, but actually it is two bodies, revolving about a common center. The two stars are of unequal size, the larger being thirty-three times brighter than our sun. The other isn't much larger than the earth, but weighs as much as our sun, which is why the two bodies will revolve about a point between them.

If you imagine compressing such a pile of lead into a pint cup you can get some idea of the solidity of the matter of which the small half of Sirius is composed. What that material is, so far has defied analysis. If this material could be classified and then reproduced on earth, science would have a new tool that would revolutionize our life. For one thing, such a metal would make an almost perfect electrical conductor. With it the power of Niagara could be wired around the world



Seated in His Comfortable Armchair, This German Astronomer Views the Heavens through His Giant Telescope, Moving the Ponderous Mass at Will with the Controls behind Him

Gaseous Nebula and, at the Right, the Huge Bright Disk of Orion; Our Sun, Earth and Planets Would Be Only a Small Bright Spot in This Enormous Nebula, Billions of Miles Away

without appreciable loss in the round trip.

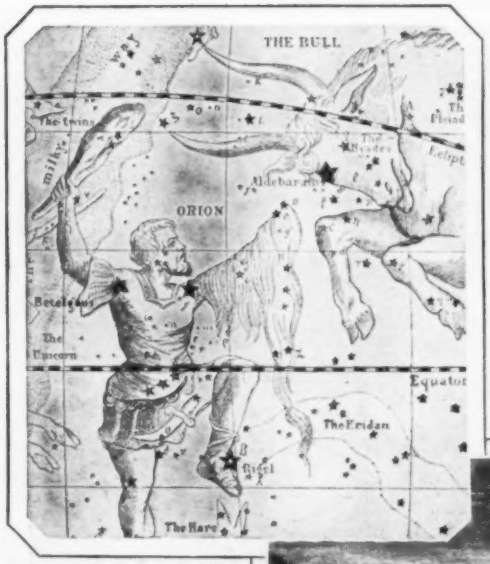
The star is far too close to the tremendous heat of its big neighbor to support life, though its size, practically the same as our world, is sufficient to hold together an atmosphere. That life does exist in some of the thousands of universes outside our own was the belief expressed recently in a lecture by Sir Oliver Lodge. He only gave voice to the opinion held by many astronomers, when he pointed out that the distribution and arrangement of matter throughout the many worlds which we can see is such as to be entirely suitable for the growth of life.

"I think it reasonable to infer the existence of innumerable habitations on which life in its various grades may have developed as it has on this earth," said Sir Oliver. "It seems absurd to suppose that this earth is the only habitable world merely because it is the only one of which we are certain.

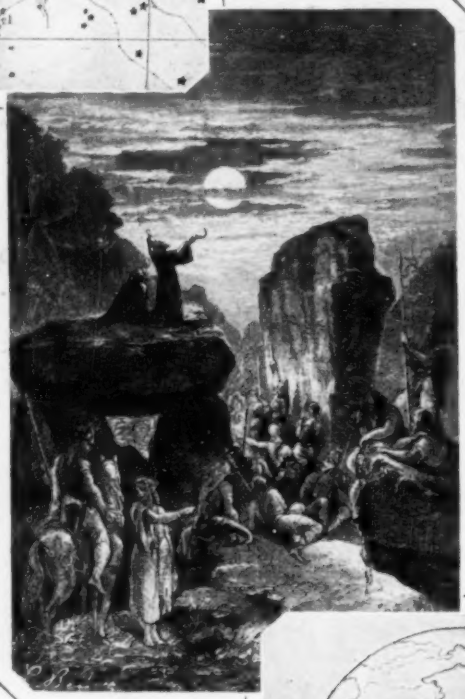
"What we find here is that life, vegetable and animal, makes its appearance wherever conditions allow. We may reasonably suppose that the same sort of thing would happen elsewhere and that amid the hosts of worlds there must be multitudes in which those conditions, whatever they may be, are satisfied.

"The universe is a sort of law-abiding organism or organization, the parts of which are worlds. It affords evidence of design and planning. There is great variety, but nothing haphazard. It is rather like looking at a workshop full of running machines. The machines appear self-working and complete, but they are full of evidence of design to accomplish a certain object.

"From what we know of details here, it is legitimate to surmise that the object of all worlds in space is to provide opportunity for life and mind to develop, and that the arrangement of matter in the



Many of Our Star Names Come Down from Ancient Folk Lore and Superstition, That Ascribed Fanciful Forms to the Heavenly Groups, as in the Old Drawing Above; at Right, Druid Sun Worshipers Are Depicted at Their Orisons at Stonehenge in Ancient England



universe is subsidiary to that important end."

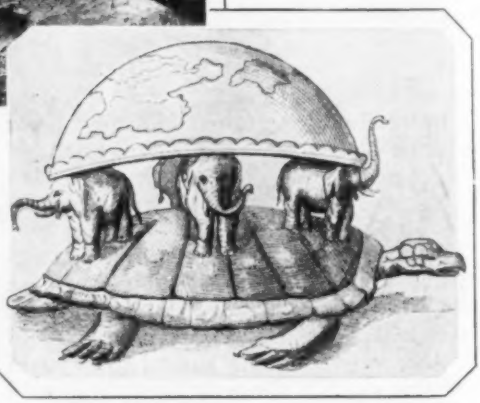
The study in recent years of innumerable far-distant nebulæ, as the astronomers call them, has revealed that, far outside the farthest stars which we see as part of our own universe, are thousands of vast groups, each forming a complete world in itself. Every solid nebula studied has presented exactly the same form—a cartwheel, thicker in the middle than at the edges. The most powerful telescope can photograph these nebulæ only as blurs of light, though each is probably composed of millions of stars as large or larger than our sun.

The distance to some of the nearest of these world groups almost defies the imagination. Despite the immensity of our own solar system—the orbit of Neptune is almost 5,000,000,000 miles across—it takes light, traveling 186,000 miles a second, or about 11,000,000 miles a minute, slightly over eight hours to traverse the distance. Yet distant stars and nebulæ have been measured which are so far away that it takes a beam of light 11,000 years to reach the earth, and there are others still farther away.

The hundred-inch telescope at Mt. Wilson observatory is capable of picking up about 300,000,000 stars and nebulæ. The latter include not only such near neighbors as those 11,000 light years away, but, way beyond that, float a million more spiral nebulæ, whose distances are said to range from 500,000 to 10,000,000 light years.

Some of the distant star clusters which are visible to the naked eye are quite well known, the Pleiades, for example. But to fly to them at 11,000,000 miles a minute, the speed of light or of a radio signal, would take 325 years, and when you arrived, you would find them to be a group of about 500 stars, as big as, or bigger than, our sun.

How the distance to these stars is

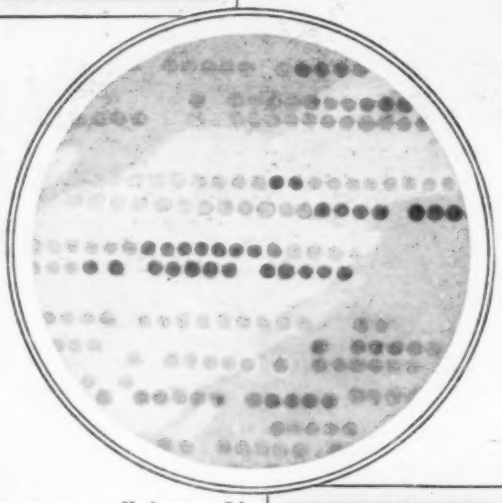


The Hindus in Olden Times Pictured the Earth as a Hemisphere, Supported by Elephants Standing on a Turtle's Back

Copyright, S. W. Clatworthy

Cross Section of the Sun's Corona and Flaming Layers Which Surround the Real Molten Sphere; Above Is a Sketch Showing How the Moon Casts a Small Shadow on Part of the Earth

Spiral Nebula Unwinding, Above, and, Right, Series of Photographs of a Number of Stars Taken at Fifteen-Minute Intervals; the Variations in Intensity Proved One Was Really a Double or Twin Star, the Two Revolving around Each Other

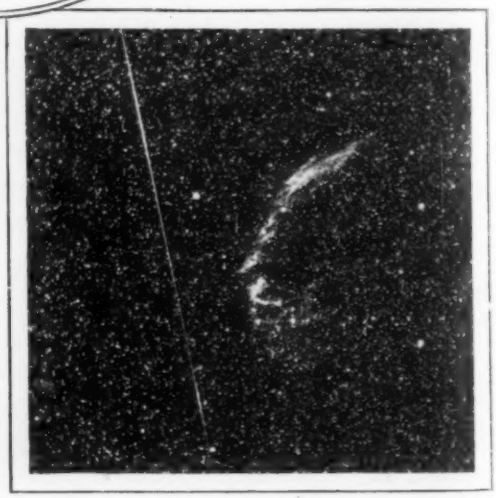


measured is a marvelous story of human ingenuity. When the distance to the moon, a matter of some 250,000 miles, is measured, observations from two points as far apart, say, as France and America, are sufficient. If a sight is taken from France and the angle measured, and a similar sight taken from America, it is as easy to calculate the point where the lines meet—the length of the base line between the two observatories being known—as it is for a surveyor to work out a similar problem in triangulation on an open prairie. For some of the close planets, the diameter of the earth itself is a sufficient base line, giving angles of sufficient size to be readily and accurately measured.

But in 1838, when Bessel undertook the first measurement of the distance to a star, he was faced by an infinitely more complicated problem. Imagine constructing a triangle with a one-inch base and two sides eight miles long, and then try to measure the angle of the sides to the base. Yet that was the proportion of his angles, though his base line was the earth's orbit itself, a distance of 186,000,000 miles. After years of calculation, he figured that the star known as 61 Cygni, in the constellation of the Swan, was forty trillion miles away.

The use of the earth's orbit as a base line was a clever idea, but made the work rather slow, for it was necessary to make one observation and then wait six months for the earth to reach the opposite side of its orbit before making the second. In fact it was so slow, with the necessary calculations, that only sixty stars had been fixed up to 1900.

Then Yerkes observatory, at Williams Bay, Wis., undertook to take over the task, using a photographic method. The idea was as clever as Bessel's. If you hold your pencil in front of your eyes and look at a picture on the wall, and then close first one eye and then the other you will see that the apparent position of the pencil, in relation to the picture, shifts from side to



The Familiar "Falling Star," Really a Meteor, Sometimes Crosses an Astronomer's Plate, Leaving a Perfectly Straight Mark

Students of an English College Helping Their Professor Place a Plate Holder on a Nineteen-Foot Camera to Photograph Recent Eclipse of the Sun, Visible Only Overseas

side. The Yerkes astronomers used a near star instead of a pencil and the distant star as a picture, and took photographs six months apart, on opposite sides of the earth's orbit. The result was that the near star had shifted in its apparent relation to the distant one, and the seeming shift could be measured and angles and distances calculated. In this way stars as much as 375 trillion miles away have been accurately located.

That, though, was about the limit of even that method, so another had to be found for stars still farther away. The sun and its planets are moving toward Vega at the rate of twelve miles a second. In twenty years this movement gives a base line forty times as long as the diameter of the earth's orbit, so observations made at twenty-year intervals, recording changes in the position of Vega in relation to inconceivably remote ones, are correspondingly larger, and the distance can be calculated. The work is made possible by the fact that vast multitudes of the stars are what is known as "fixed," meaning they show no apparent change in position. Actually they are hurtling through space at tremendous speed, but the distance to them is so great that their motion is not apparent. A passenger in an airplane high above the earth, speeding at 100 miles an hour, does not feel that he is going any faster than in an automobile at a quarter of that speed, or less. The reason is that his view ranges so much farther, and there is nothing near by to help him judge his speed. Similarly, the observer on the ground does not appreciate the great speed of the airplane because of its distance. Enlarge the plane to the size of a star, but move it a few trillion miles away and you will see why the stars appear to be fixed in space.

One odd thing about distant stars is that what appears as a single one often is two, as Sirius, or more. The presence of such plural stars was first disclosed by measurements made of the light emitted by one of them, revealing the fact that the star was both approaching the earth and going away from it at the same time.

DELIVER PAPERS BY AIRPLANE WITH SMALL PARACHUTE

Delivering Papers by Airplane: the Bundle Attached to Its Parachute, Settling to the Ground

Commercial application of the airplane has been somewhat restricted because of landing and take-off difficulties, but recent experiments at delivering goods from moving ships by means of special parachutes, indicate that the number of landings may be reduced to a minimum. Shipments of typewriters have been unloaded in this way, and, a few days later, bundles of newspapers were dropped from a monoplane in California and reached the ground gently after a quick fall of but a few feet to give the parachute time to open. The chute and newspaper pack weigh but five pounds. They are released when the pilot pulls a cord.

HOW SALVAGING FARM TOOLS HELPED RESTORE SOUTH

Following the disastrous floods in Mississippi, Arkansas, Louisiana and Tennessee, relief agencies were faced with the immediate problem of saving human lives and then putting farms into operation again as quickly as possible. A detail of that task involved a gigantic salvaging plan which saved millions of dollars and enabled growers to plant crops before the season was too late. Officials of the International Harvester company consulted their records, and wherever they found a tractor or other farming implement they had sold, whether it was paid for or not, they went to the owner with this proposition: "Get your wrench and oilcan and come with us. We stay with you until your tractor is running and the service will not cost you a cent." In a few weeks, more than 2,000 farming implements, that had been under water, were in working condition again and the owners were spared the expense of buying new equipment and the cost of delays that would have resulted otherwise. With the encouragement of Secretary Hoover, farmers were induced to plant corn, alfalfa, oats soy beans and other crops that had never been raised before in these sections.

DISAPPEARING BED INSIDE AUTO LATEST CAMPING COMFORT

Concealed behind the rear auto seat when not in use, a spring bed with felted mattress, four feet wide and over six feet long, is quickly extended and saves carrying extra luggage on the running board. It clears the seats, the cushions are not used as supports or removed, and, hence, it does not damage the upholstery.

Drawing to Show How the Bed Folds Up under the Rear Auto Seat When Not in Use

Palace of the Maharajah of Mysore as It Appeared under Electric Illumination; the Display Reveals the Intricate Details of Indian Architecture

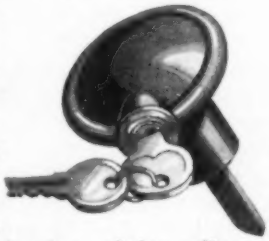
SPLENDOR OF ORIENTAL PALACE MAGNIFIED BY LIGHTS

How modern genius can be applied to emphasize the wonders of bygone days is well illustrated in the use of electric lights on famous buildings. Architectural details are thus more clearly revealed and the beauty of the structure heightened instead of lost in the night. When the maharajah of Mysore entertained the viceroy of India recently, he spared no pains in lavish hospitality, a feature of the occasion being the illumination of his palace, which glowed like luminous lace.

FIRE EXTINGUISHER LIKE PISTOL WORKED WITH ONE HAND

To operate a hand fire extinguisher now on the market, you simply pick it up, point it at the fire and pull a trigger. An effective stream of flame-smothering liquid is projected from the barrel of the pistol-shaped unit to a distance of thirty-five feet. The extinguisher is easily reloaded, and working parts are not subjected to corrosion by contact with the chemical. The article is also serviceable as a substitute for a revolver in repulsing attacks, and, as only one hand is needed to use it, the other is left free for aid in defense or putting out fires.

CYLINDER LOCK IN DOOR KNOB GIVES ADDED PROTECTION



A door knob that locks and simply spins around when it is secured, without opening the door, is one of the most recent accessories for protection. It is quickly attached in place of the ordinary knob and fits any door. When unlocked, the knob operates the latch in usual fashion, but when the key is turned and the door locked, the outside knob merely turns without engaging the latch.

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Mount Wilson Observatory, in California, Which Houses the Only Hundred-Inch Telescope in the World; It Is a Reflector, Employing an Eight-Foot-Four-Inch Polished Mirror

THE largest eye in the world is planned for southern California. It will be ten feet in diameter.

A reflecting telescope it will be called. It will be set upon the summit of Mount Wilson, and its chief purpose will be to photograph celestial objects.

Nothing could better illustrate the ambition of man to extend the range of his knowledge and to overleap the limits of the faculties with which nature has endowed him. In the development of aids to vision lies one of the greatest of all human achievements. Yet the earliest telescope dates back only to 1608, and spectacles were not known until near the end of the thirteenth century.

Their invention is attributed to an Italian, Salvino degli Armati, and for a long time nobody thought of any other way to use them than by holding them on the nose with one hand while reading or writing. Pictures of the fifteenth and sixteenth centuries show people using them in that way. Later, when the supporting "bow" had been adopted—at first of iron or leather, and then a spring—Nuremberg manufactured spectacles in enormous quantities, distributing them to all parts of the world.

Right there was the beginning. The telescope gave to man supersight, and the climax of its development will be represented by the gigantic ten-foot eye at Mount Wilson.

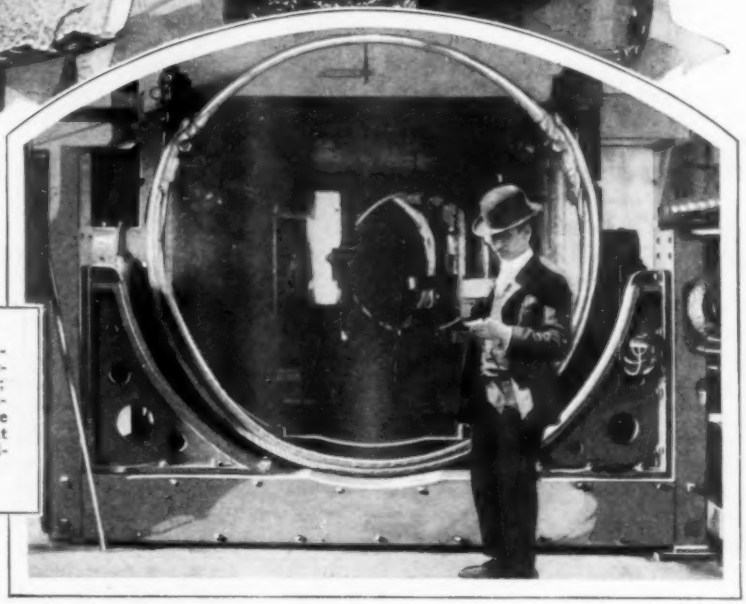
The astronomical observatory already there has the largest reflecting telescope in the world, with a mirror lens 100 inches in diameter; but the reflector of the contemplated instrument will be nearly half again as big, gathering a proportionately greater number of light rays from a celestial object viewed.

Reflecting telescopes are a relatively new invention. For a reason presently to be stated, they can be made much larger than those of the more familiar kind, which are called refracting telescopes. They are constructed on a wholly different principle.

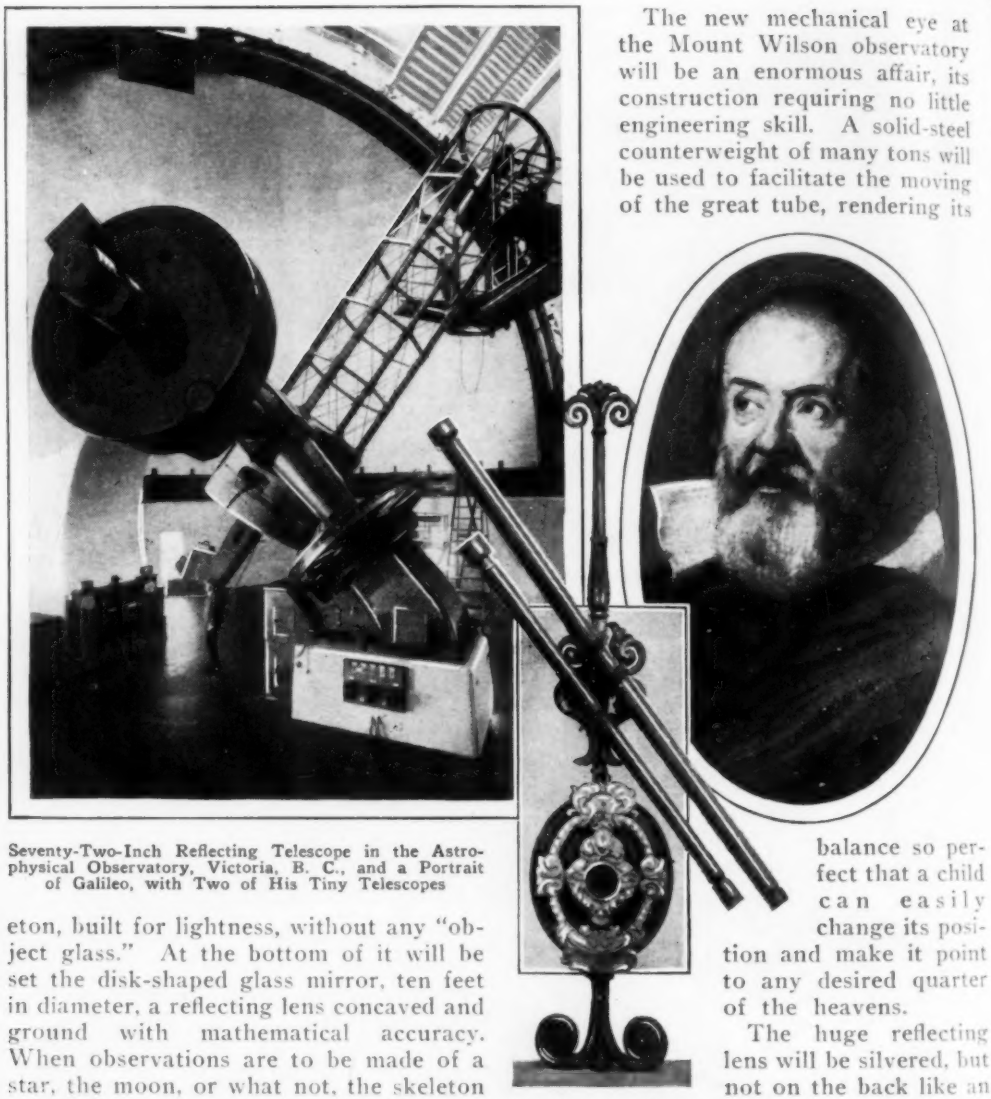
Thus the huge one planned for Mount Wilson will be a tube that is a mere skel-

Grinding Big Telescope Lenses for Refractor Instruments, Which Are Similar in Design to Opera Glasses or Binoculars, the Light Being Focused by a Series of Lens Groups; Right, Optical Glass Fresh from the Melting Pot

Twenty-Six and a Half Inch Object Lens for a Big Refracting Telescope, Ground and Mounted Ready to Be Installed; the Workman Gives a Comparison to Show the Size of the Big Glass



The Mirror of the Hundred-Inch Reflecting Telescope at Mount Wilson; the World's Largest Refracting Instrument Is the Forty-Two-Inch Lens at Yerkes Observatory, Williams Bay, Wisconsin



Seventy-Two-Inch Reflecting Telescope in the Astrophysical Observatory, Victoria, B. C., and a Portrait of Galileo, with Two of His Tiny Telescopes

eton, built for lightness, without any "object glass." At the bottom of it will be set the disk-shaped glass mirror, ten feet in diameter, a reflecting lens concaved and ground with mathematical accuracy. When observations are to be made of a star, the moon, or what not, the skeleton tube will be covered with a cylindrical envelope or canvas.

The light rays that come from the celestial object pass through the length of the tube to the mirror disk, which reflects them back in the shape of a cone, thereby concentrating them and bringing them to a focus upon a prism. The prism diverts the focused rays at right angles to an eyepiece at the side of the tube. The observer, looking through the eyepiece, sees the image of the star or other object. Or his eye may be replaced by a camera specially designed for making astronomical photographs.

The new mechanical eye at the Mount Wilson observatory will be an enormous affair, its construction requiring no little engineering skill. A solid-steel counterweight of many tons will be used to facilitate the moving of the great tube, rendering its balance so perfect that a child can easily change its position and make it point to any desired quarter of the heavens.

The huge reflecting lens will be silvered, but not on the back like an ordinary mirror. The silver will be on the outside of the lens, on top of the glass, so that light rays will be reflected directly from the bright metal. That in itself seems odd, for silver soon tarnishes, and one might suppose that its usefulness as a reflecting surface would thereby soon be spoiled. Undoubtedly that would be the case, were it not for the fact that the disk will get a fresh coat every two weeks, being lowered for that purpose into a tank of molten silver. In order that changes of temperature may not affect its shape, a specially contrived refrigerating apparatus will be used in summer to keep it cool.

In making an object lens for a large refracting telescope, the chief difficulty is to get a piece of glass big enough that is of the requisite purity and flawlessness. That is what puts a limit on the size of ordinary telescopic lenses. But there is no such limitation where reflecting telescopes are concerned, because a few flaws more or less in the glass do not matter. It is covered by a silver coat anyway, and the main requirement is that it be ground to a concavity that is perfectly true.

The most important recent advances in astronomical knowledge have come through the invention of the reflecting telescope. It is particularly well adapted for celestial photography. Pictures taken at Mount Wilson, with the 100-inch instrument, of landscapes on the moon, the surface of the sun with its whirling storms of fire, so-called "spots," and distant nebulæ which are believed to be universes distinct from ours, are marvelously beautiful, far surpassing any heretofore produced.

It is a far cry from the telescope of Galileo to the monster sky-searching instruments of today. The invention, like many another, was an accident. In October, 1608, an apprentice in an optician's shop at Middleburg, in Holland, playing with some lenses, found that by holding two of them in certain relative positions, he obtained an enlarged inverted view of objects. His master, Hans Lippertuy, having his attention called to the phenomenon, fixed a couple of lenses in a tube and showed the device as a toy in his window. It could see a man two miles away!

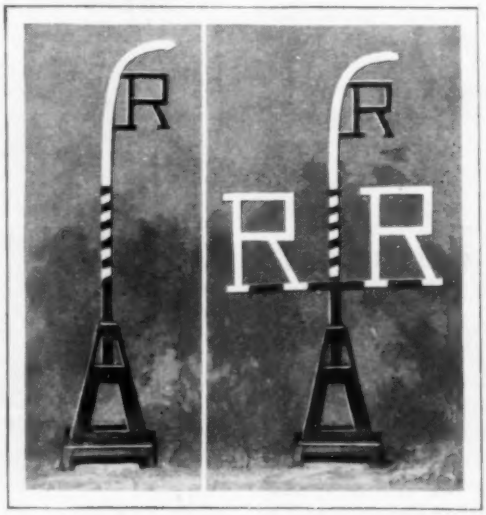
Galileo, then residing in Venice, chanced to hear about this curious "spyglass," in June of the following year. He made several telescopes. With his fifth he discovered Jupiter's moons, opening new worlds for human discovery.

Studying an Enlarged Reproduction of Fingerprints for Better Identification; Minute Marks Are Preserved

FINGERPRINTS ENLARGED TO AID IDENTIFYING CRIMINALS

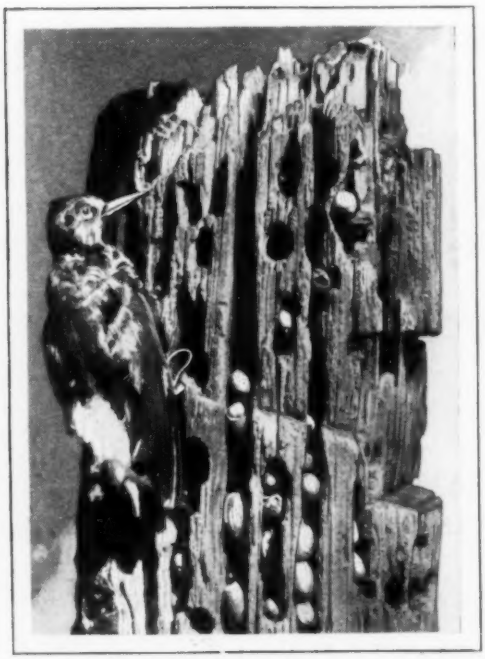
For more accurate comparison and study of the fingerprints of criminals and suspects, a means of magnifying them without spoiling or altering the distinguishing marks has been devised. Some of the prints are enlarged as much as 500 times. In this size, they are effective as courtroom exhibits in presenting evidence and accentuating telltale features.

TRAFFIC SIGN IN SILHOUETTE IS MORE EASILY READ



Easily Read in Frost or Storms; the Silhouette Traffic-Signal Posts for Highways

For greater visibility, auto-traffic signs along the highways are written in silhouette lettering, with conspicuous markers near by. Tests have shown that this style does not become obscured after frosts or storms so readily as printed ones. The plan may be adapted for directing airplane traffic as well, for the letters may be laid out on top of roofs or on a landing field.



Niches in the Wood Afford the Bird Convenient Storehouse for Food but Are Disastrous to the Timber

THRIFT OF WOODPECKER HARMS POWER LINES' POLES

Woodpeckers devour many harmful insects, but also do considerable damage to wooden power-line poles by using them as storehouses for their food. As the accompanying illustration shows, the birds have a habit of drilling holes in the wood and inserting acorns and other morsels. The acorns decay and sometimes harbor worms, which the bird relishes. Holes in the pole weaken it and expose it to rot. Along some of the lines that pass through extensive wooded territory special patrols are maintained to keep the woodpeckers and other birds away.

UNDER WATER LIGHTS IN POOL HELP PROTECT SWIMMERS

To eliminate shadows and enable the swimmers to see the bottom of the pool more clearly, lights have been installed under the water in an outdoor pool at Jefferson Barracks, Mo. They cause no glare and eight lighting units are sufficient for the tank, which is 130 feet long and fifty feet wide. The lights are inclosed in specially constructed projectors.

NO SHORTAGE OF TIMBER IN U. S. ASSOCIATION DECLARES

Contrary to public opinion, there is an abundance of timber in the United States at the present time, according to the National Lumber Manufacturers' association, and the problem of a future supply is one of sufficient consumption now rather than overuse. In other words, the body points out that it is not economical to preserve "ripe" trees indefinitely, for only by marketing those that are ready for use can the industry be assured of reasonable profits from the work of growing trees.

FIND SHIPS HIDDEN BY FOGS WITH ELECTRIC BEAM

Will the smoke screen, laid down to protect battleships, become obsolete and useless? Possibility that it may, is suggested in a recent invention by John L. Baird, television expert, whereby an electric beam is made to penetrate smoke and mists and produce a sound whenever it meets an obstruction. The nature of the obstacle is determined by focusing the beam upon a screen attached to the apparatus. Tests with the outfit on a coastal steamer, running between Dundee and London, indicate that the electric eye will be of great help in locating vessels in fogs, thus resulting in a decrease in maritime accidents with a possible reduction of insurance rates as a consequence.

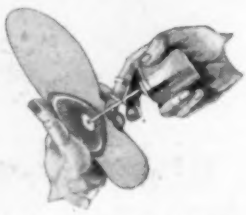
John L. Baird, Standing, with Sir Arthur Keith at the Electric Apparatus Which Penetrates Mists

Swimmers in the Dog Masks Starting the Race from the Punt Disguised as a Row of Kennels; the Event Proved an Interesting Novelty at an English Meet, Due to Popularity of Greyhound Racing

SWIMMERS IN DOG DISGUISE ADD SPORT TO RACE

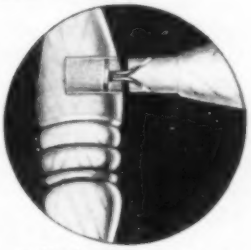
The popularity of greyhound racing was reflected at an English resort recently when swimmers donned papier-mache dog masks and leaped from a punt disguised as a starting box for a race. The masks were adjusted so as not to interfere with the swimmers' vision or breathing and, being of light weight, caused little, if any, discomfort to the wearers.

AIR-CUSHION PAD INSIDE SHOES RELIEVES FOOT ILLS



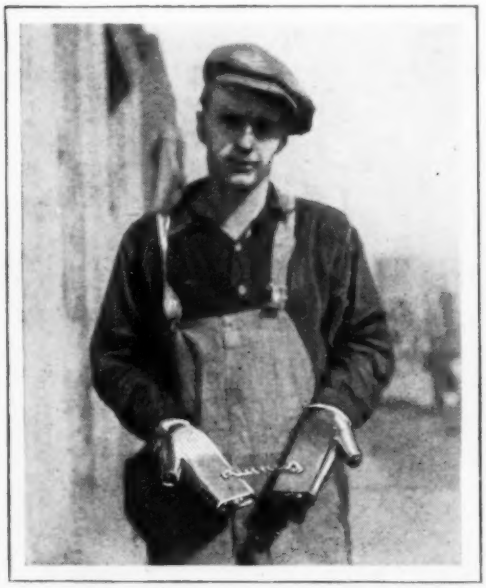
Adaptable to the form of the feet, an inflated air cushion fitted inside the shoes, is said to provide a helpful support to the arch, does not change the shape of the shoe and keeps the foot from sliding off, a common trouble with many styles of supporters. It is light in weight and, since it can be inflated to different degrees, solves the problem of raising the arches gradually.

CHAIR WITH LOCKING JOINTS HAS LONG LIFE



Parts of a chair now on the market are held together by a patented mortise-and-tenon lock joint as well as glue. This joint is so adjusted that the harder a member is pulled, the more securely it holds, as the pronglike extensions of the joint become more firmly imbedded in the wood.

¶Experts have estimated that the average American breathes as much as five times his own weight in soot and dirt every twelve months.



For Added Protection against the Dangerous Captive; Steel Mittens That Prevent Using Gun

STEEL MITTENS AS HANDCUFFS PREVENT USING GUN

To restrain prisoners from using knife or gun, steel-mitten handcuffs have been devised by a western man. They are hinged in the palms so that the hands may easily be inserted.

GASOLINE FROM COAL AVERTS THREATENED OIL SHORTAGE

After fifteen years of toil, a synthetic gasoline, the invention of Dr. Friedrich Bergius, has been placed on the market in Germany. The introduction of the product in this country is not expected for some time. At the present time chemists are at work on the process which may greatly reduce the price of gasoline. The new fuel is produced by combining hydrogen gas with coal by means of high heat and pressure. The coal is pulverized and then mixed with a heavy oil to a pasty mass. This is then placed into a light steel retort and heated to about 800 degrees Fahrenheit under a pressure of some 3,000 pounds per square inch. A complex mixture of gases is obtained, as most of the carbon unites with the hydrogen. And then there are the liquid and solid compounds similar to those extracted from natural wells. Through the principles of the Bergius process, as much as 90 per cent of the carbon in lignite, a low-grade coal, is transformed into such oil products. A ton of common bituminous coal, experiments have shown, will yield 300 pounds of gasoline, 400 pounds of heavier oils available for Diesel internal-combustion engines, 120 pounds of lubricating oils and 160 pounds of fuel oils. From these figures, scientists point out, it can be seen that any threatened oil shortage within the next century will be averted. It will seem a crime, they say, within the next few years to burn coal for fuel when it contains such valuable ingredients.

PRINTING PICTURES MADE EASY BY COMPOSITION BLOCK

An engraving block, built up of a cellulose composition, which is easy to cut in any direction, as it has neither the grain of wood nor the fiber of linoleum blocks, has been patented by an Omaha engraver, who is marketing the blocks in any desired size, as well as tools for cutting anything from a simple poster to the finest of line work. The block is said to be durable, and will stand up under press runs of 20,000 or more without showing appreciable wear. It is suitable for all forms of work, from simple monograms to large advertisements, and, as its surface is colored, it is easy to engrave. The outline of the drawing can be placed directly on the block with pen or pencil.

Cutting Engraving Block in Composition Material, and, Inset, Sample of Fine Line Work

Specimens Which Have Been Preserved by the Paraffin-Bath Treatment, Making Use of Alcohol or Other Liquids Unnecessary; Some Animals Can Be Kept without Removing Internal Organs

PARAFFIN BATH FOR SPECIMENS PRESERVES NATURAL FORM

Animal and vegetable specimens are said to be preserved in their natural form and colors more faithfully than can be done by other methods through a process developed by professors at the university of Vienna. Because the samples are kept dry, making the use of alcohol or other liquids unnecessary, the system promises great aid to biology and botany students. A first step is treatment with a special fixing liquid which prevents deformation and shrinking. Following this, the specimen is subjected to a paraffin and preserving bath, during which it absorbs the substance, becoming stiff, and the water content is driven out. The fixing preparation is applied as soon after the death of the specimen as possible. It is said that the process can be performed without first removing an animal's organs. In the field of botany, it promises aid, as the natural colors and form of flowers and leaves are preserved.

SHOWERS OF "VOLCANIC ASHES" PROVE TO BE POLLEN

Botanists rather than geologists were required to solve a recent mystery in Alaska—the appearance of a fine yellow dust that was at first supposed to be ash from a distant volcano. Examination showed that the substance was pollen from spruce trees.

Comfort for the Traffic Policeman While on Duty; Booth and Oil Heater Keep Feet Warm

HEATER FOR TRAFFIC POLICE MAKES WORK EASIER

With an oil heater and a protecting shield about his post, a traffic policeman in Boston is guarded from chill winds and dampness while on duty. The walls about the station help retain the warmth from the heater and protect the officer's feet.

LIGHT STREET LAMPS BY RADIO IN EASTERN CITY

Similar in many respects to the familiar radio transmitter, a long-wave, low-powered vacuum-tube sending set, operated for a few seconds daily, controls all the street lights in the city of Glens Falls, N. Y. The system, developed by engineers of the General Electric company, marks the first commercial application of radio to such a function, and is so regulated that instead of spreading out in all directions as they do in radio broadcasting, the impulses are confined to the wires to receiving stations. There switches are tripped, relays operated and lights turned on or off. Only five seconds are required to illuminate them; when the operator turns the "off" button in the power house, the transmitter automatically operates for ten seconds and cuts off the lights. Among the advantages claimed for the system are the following: existing circuits are used for transmission of control energy; the usual distribution of power is not affected in any way; interference with telephone and radio space is avoided, and the system is equally applicable to grounded and ungrounded distribution installations. Lightning, switching surges or stray currents do not operate it, and since the "on" and "off" operations are distinctive, there can be no doubt as to the condition of the circuit at the remote point of control.

CHIMNEY CLEANER AND DRAFT COMBINED IN ONE

Better regulation of the furnace draft and a means for quickly cleaning the chimney are afforded in a patented installation introduced by a western inventor. It consists of a brush, operated on an endless chain by a crank, to scrape off soot and dust inside the flue. The door to the brush chamber, which opens at the base of the chimney, is hinged and has a chain leading to the front of the furnace for easy adjustments affecting the draft. The outfit is said to give protection against fires, reduce fuel consumption and improve the operation of the heating plant.

A Turn of the Crank Helps Clean the Chimney, as Brush on Endless Chain Inside Is Drawn Along

The Specter of the Brocken as Seen on the Top of the Famous German Mountain When the Setting Sun Throws the Explorers' Shadows against a Rainbow-Marked Bank of Clouds

FLYING across the Pacific, bound for Honolulu, Smith and Bronte, pilots of the "City of Oakland," sighted a number of islands where no islands were. When they finally reached the leper colony of the archipelago on the last drop of gas in their tanks, they believed, at first, it was only another mirage, and hesitated about picking out a place to land.

Col. Charles A. Lindbergh, on his flight to Paris, encountered the same sort of mirage, several hundred miles before he reached the Irish coast. Ahead of him he saw mountains, valleys and grassy glades that looked so real it was difficult to reconcile them to the fact, which he knew, that he was still some hours from the nearest land.

Mirages are not at all uncommon, though aviation has made it possible for anyone who cares to go up to have the chance of seeing at least one. The world's most famous optical illusion, the Fata Morgana of the Straits of Messina, has recently succumbed to modern photo-telescopic cameras and been reduced to paper.

The Fata Morgana is a mirage seen occasionally from the Italian side of the straits, which lie between Italy and Sicily. For hundreds of years it has been famous as the mysterious city, popularly believed to be built on a submersible island, and home of the Fairy Morgan, sister of King Arthur of the Round Table. She, according to the superstitious Italians of the neighborhood, is an immortal princess, possessed of magic powers, and at her will the island rises or sinks beneath the sea. They tell stories of mariners lured to the misty city, cast away on its shores, and never seen again.

The phenomenon is actually an illusion —a distorted image of Messina, far away on the Sicilian side of the straits, and not, under ordinary conditions, visible to the watcher in Italy, for, because of its distance, it lies far below the horizon.

But occasionally, on the afternoon of a hot day, when the sea is unusually calm, a layer of air, cooled by the water, overspreads the sea, with a warmer layer just above it. This juxtaposition of two layers of different densities causes a bending of light rays toward the observer, and he act-

ually sees objects which are below the horizon. The appearance of the mirage is always preceded by the forming of a streak of mist along the horizon where the two layers of air meet, due to the condensation of moisture in the calm air by the coolness of the sea. Presently the mist dissolves, and the magic city begins to uplift itself in the distance, its towers and palaces taking form with all the seeming of reality, only to melt away, become indistinct, and disappear after a little while.

The image is not a true picture of the hidden city across the straits, but is made up of indistinct and wavering lines, the distortion accounting for the fact that the superstitious natives never connect the vision with its actual cause.

Occasionally the atmospheric conditions may be reversed, with the cool air above a warmer layer, and then the vision is reversed; and the fairy isle of Fata Morgana is apparently seen beneath the surface of the sea. That is the form of the true mirage seen on the desert, while the city in the air is technically ascribed to "looming."

The most common desert mirage takes the form of a cool lake of water, which appears miles ahead of the thirsty traveler. Actually, the mirage is due to the bending of light rays in such a way that a portion of the sky appears below the horizon, giving the impression of a blue lake. Looming also is fairly common in the desert, the mud walls, towers and minarets of far-distant villages appearing in the sky. The soldiers of Napoleon on the Egyptian campaign were so awe-struck by the spectacle that they fell down and prayed.

Alaska and Greenland both are famous for their aerial phantoms. Seamen sailing along the east coast of Greenland see amazing spectacles; due to the air over the icecap being chilled, while warmer currents lie above it. Then the light rays are bent downward and the distant cliffs, viewed through a telescope, appear as

St. Elmo's Fire, Top; an Actual Spectral Image Photographed on a Cloud, and the Death of Prof. Richman a Russian Scientist, from Lightning

Spectral Image Sketched from a Ship off the Coast of Greenland, Showing the Spires and Towers Produced by Distortion of Light Rays in Two Currents of Hot and Cold Air

huge cities, with domes, minarets, obelisks and medieval fortifications. The structures have all the appearance of being substantial, save that their forms are constantly changing.

The Silent City of Alaska occasionally seen above the great Muir glacier, is a similar phenomenon. It looks so much like an ancient fortified city that spectators have often sworn they saw people walking in the streets. Actually both the visions are due to distortion of icy pinnacles and peaks.

It isn't necessary, however, to go to the desert or arctic wastes to see mirages, for aviators encounter them regularly in flying through clouds. Drops of moisture in the atmosphere break up the light and form marvelous rainbows, which, unlike the bows seen on land, are complete circles, as the eye is not limited by the horizon. Instead of the single or occasional double rainbow on the ground, there may be many of them, one inside the other, and, if the position of the sun is right, in the exact center of the concentric bows will be the image of your airplane. The image is simply the shadow of the plane, thrown by the sun on a near-by cloud.

The famous Brocken specter of Germany, and similar illusions seen by mountain climbers, are due to the same cause. The phenomenon was first observed on the Brocken, a noted German mountain, when an explorer was startled to see what he described as an enormous giant walking along through space. The sun was behind him at the time and threw his shadow on the cloud bank, greatly magnified, and as the mountaineer walked, the shadow appeared like some advancing giant. Around the specter is often seen one or more rainbow circles.

Not all mysterious phenomena are as easily explained. No one, for example, has ever been able to account for ball lightning, first recorded when the pious worshipers of Tours, France, saw a huge ball of living flame hover over the head of Bishop Martin while that prelate, afterward made a saint, was dedicating a cathedral. Yet, the appearance of these huge balls during thunderstorms is not at all unusual, and many have been startled by seeing them hovering in the air, rolling through a house or across the ground, sometimes striking the earth and rebounding into the air, and again bursting with a terrific thunderclap.

Dazzlingly bright, they are sometimes white, sometimes blue, and again red. Some who have seen them have described a peculiar hissing, humming sound as they moved, and their speed may be fast or slow. They apparently have an inclination toward entering houses, floating in through open doorways or windows or coming down the chimney. Now and again they set fire to buildings; occasionally they kill people. In one recorded instance, a lightning ball killed a dog in a girl's lap without harming her.

In size, they may be anything from that of a golf ball to several feet in diameter.

Photograph of the Fata Morgana, the Illusion Which Brings the Picture of the Distant City of Messina over the Curvature of the Earth, to Make It Visible from the Italian Shore

During the progress of the tornado that struck Louisville, Ky., in March, 1890, numerous balls of living fire, the size of oranges, added to the fright of the terror-stricken victims. In the darkness, all of the lights of the city having been put out, they rolled about the streets and along telephone wires and the cornices of buildings, and finally exploded with tremendous reports.

A Russian scientist, who tried to duplicate Benjamin Franklin's kite experiment, failed to take proper precautions. A ball of lightning ran down his kite string, blew up, killed him and knocked his assistant unconscious.

On high mountain tops, tufts of light often appear about persons' heads. At sea the same thing is seen on the mast-heads and rigging of vessels. It is known as St. Elmo's fire. It may sometimes be seen springing from church steeples or other prominent points. It is not at all mysterious, being merely a static discharge such as the familiar "brush discharge," seen about high-tension electrical apparatus when operated in the dark.

FLYING BICYCLE TO HAVE SPEED OF FIFTY MILES AN HOUR

Revival of the bicycling craze is seen as a possibility in the invention of a Viennese engineer who has added wings and a propeller to the unit for travel through the air. He hopes that the rider will be able to attain a speed of forty to fifty miles an hour, rise from the ground at will, reach altitudes of 3,000 feet, and all with practical safety. Tests with a quarter-size model of the machine have justified his predictions, he asserts. The propeller is sufficiently high above the bottom of the rear wheel not to interfere with travel on the ground; the entire outfit is to weigh not more than 100 pounds. The wings and guiding planes are controlled by moving the handlebars.

GAUGE TO PLACE DOOR HINGES SAVES TIME AND ERROR

To simplify the task of fitting hinges, a gauge is hung from the top of the door and the size and positions of the hinges indicated on the wood by adjustable cutter heads. A rap of a hammer on each of the three marking units is sufficient to outline the places to be chiseled out. Repeating the operation against the jamb, insures accurate matching.

PROFITS FROM PONTOON BRIDGE REWARD BUILDER

Ability to serve the community in an emergency has put dollars into the pocket of an Oregon man and prevented serious delays in travel. A flood wrecked the steel bridge over the Rogue river at Galice, but one of the enterprising citizens quickly secured a franchise from the county court and constructed a pontoon bridge, on four anchored scows, at a total cost of not more than $700. Tolls have paid for the bridge, and more besides, while the steel viaduct was being rebuilt on higher piers to prevent a repetition of the washout.

RAILWAY KEPT FREE OF WEEDS WITH PUSH-CAR CUTTER

From an ordinary flat push car, and at an expense of about $18, a Pennsylvania railroad foreman has constructed an efficient weed cutter to keep the right of way free from growth that damages ballast and ties. The cutter itself is like that of a farm mowing machine, and the outfit has cut more than twenty-five tons of weeds on a stretch of over six miles, doing

Mowing Weeds along Railroad Tracks with Push-Car Cutter, Made by Foreman at Little Expense

in four hours what would have taken six men about five days with hand tools. Only one man is required to operate it, the cutter is adjustable to different heights, makes a swath four feet wide and, when not in use, can be elevated to an upright position. A small motor car furnishes the necessary power.

Boguslawski with the Scale Used in Weighing Hand Pressure He Exerted in Playing Selection

POWER NEEDED TO PLAY PIANO MEASURED BY SCALES

Moissaye Boguslawski exerts hand and finger pressure of more than four tons while playing Rubinstein's "Staccato Etude," making as many as 540 chord strokes to the minute. Three pounds to a chord is about the average pressure, as shown by scales which are used as the piece is played to record the effort required. In one performance, he finished the number in six minutes with a total pressure of 9,720 pounds.

CARRY LOCOMOTIVE ON MULES FOR MEXICAN MINE

Since many mines in Mexico are located far back in the mountains and accessible only by narrow trails, it is necessary to transport the machinery on the backs of mules. This has been successfully done with units as large as locomotives, which are thus transported, piece by piece, across the rugged country and reassembled at the mines.

¶A radio loud speaker has been successfully used in a German orchard to frighten away birds.

Absence of Braces under This Monoplane Wing Is Calculated to Make Greater Speed Possible; Support Is Obtained by Cantilever Construction of the Wing Itself

PLANE WING WITHOUT STRUTS SUPPORTS SEVENTEEN MEN

To test the strength of the unstrutted wing of a monoplane recently constructed, seventeen men stood on the ship, and careful measurements showed that it suffered no damage and did not sag under the weight. The wing bracing is entirely concealed within the outer fabric and is constructed on the cantilever principle. Absence of the struts outside will afford possibility of greater speed.

SHIELDS ON OBSERVATION CARS ADD TO TRAVEL COMFORT

Travelers riding on the roofless observation cars of a western railroad this season enjoyed further comfort as each seat was protected by a glass windshield, breaking the force of the breeze and warding off smoke and cinders. The protectors were designed and adjusted so as not to obstruct the view.

New Observation Car of Western Railroad with Seats Having Separate Windshields to Keep off Smoke and Dust

RADIOMEN MAKE OWN WEATHER TO TAME STATIC

Radio manufacturers have called in the "air-conditioning engineer" to aid them in making tests on the effect of weather on reception and broadcasting. In their laboratories, temperatures from zero to 100 degrees, or higher, can easily be created and a wide range of humidity percentages produced to determine any significant reactions. Another problem of the weather-radio question is more definitely studied, namely, what the interior temperature and moisture should be to keep the set in the most satisfactory working condition. Will air that is too dry warp and damage the set as it does the piano and other furniture? What is the result of too hot and dry air on batteries? Tests have shown that dry air frequently causes the acids in batteries to creep out of the boxes upon the

floor, and that is why some radio users find the best place for the batteries in the basement. A suitable mixture of moisture with air in the house is better for the radio as well as for health, the experiments have shown. In the broadcasting rooms, improved ventilating and air-conditioning apparatus has been installed, to insure more comfort for performers and better quality of the music.

MYSTERIES OF PRECIOUS GEMS PUZZLE SCHOLARS

What becomes of a diamond when it is burned up? It leaves no ash and when it finally blazes itself out, there remains not even so much as would dust the point of a needle. Sapphires are shrouded in mystery. In the Orient, there is a species of spider which dies suddenly when placed in a box along with the gems. According to one scholar, this jewel "feels with the air," sympathizes with the heavens and does not shine equally when the sky is cloudy or bright. Opals also present a number of riddles. They are comparatively soft when taken out of the earth, but grow harder after exposure to the air. Plunged into water, they disengage small bubbles of gas while their warm tints are sometimes emphasized by the heat of the hand. Turquoises are noted for their peculiar color changes. Often they are pale, then turn spotted and may change from blue to white. Their original value may double or treble in a single night because of these mystifying changes. One of the rare and costly stones, Alexandrite, has not yet been satisfactorily imitated. This gem is emerald by day and amethyst by night. Genuine rubies contain little bubbles and have a silky sheen. Experts have found such successful ways to imitate them that extensive research into the genuine stones, which are worth about twelve times as much as diamonds, weight for weight, has been dropped.

Branding Beef with the Needle Marker; Stamp Is Imbedded beneath the Surface for Permanence

NEEDLES BRAND FRESH BEEF TO IDENTIFY GRADE

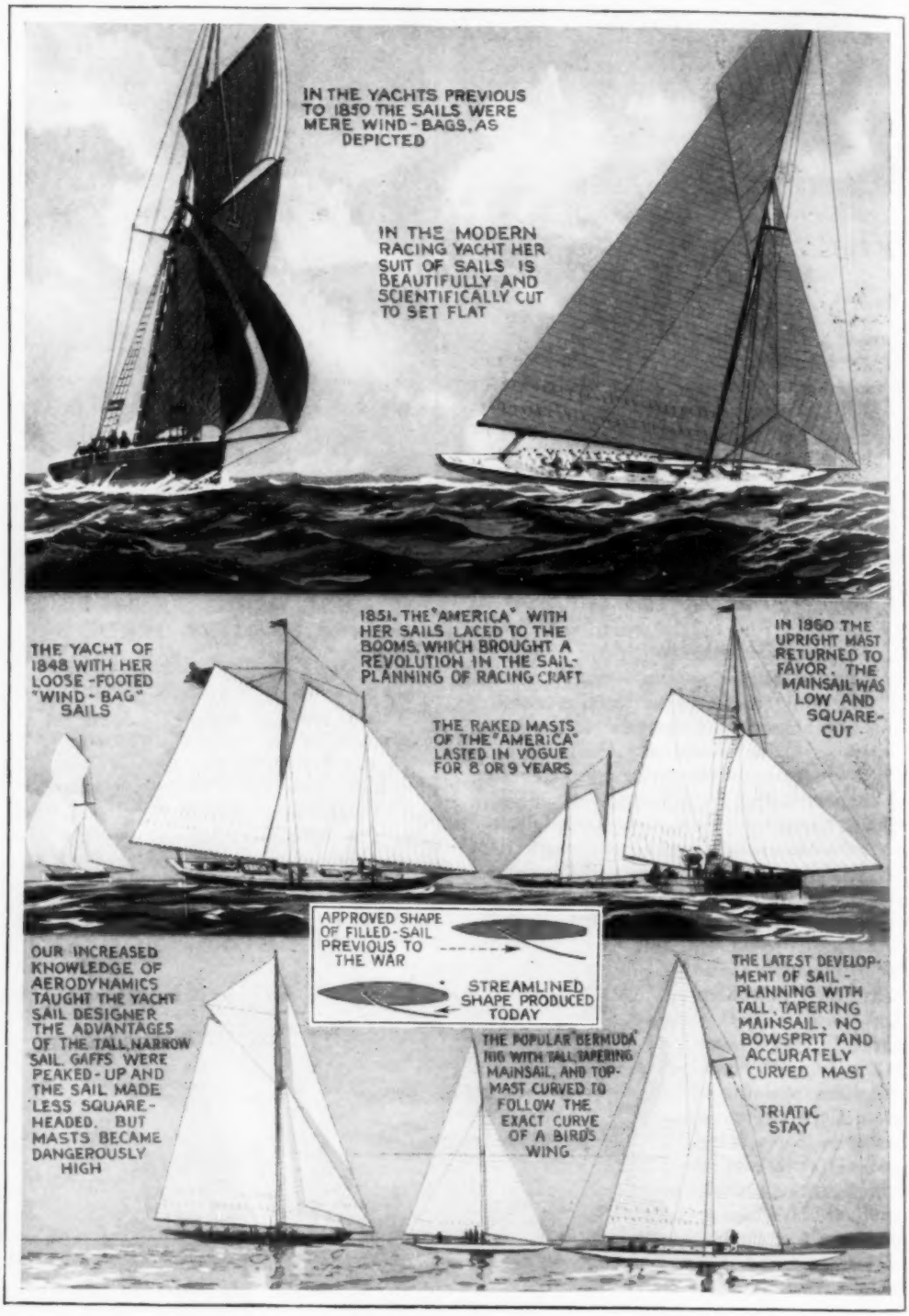
The two best grades of its fresh beef are being stamped with a needle-branding device by a packing company. The marker is constructed of phonograph needles that prick the design on the meat as the unit is rolled over it. The sign is repeated quickly, and little time is required to register the identification. It is said that 60,000 needles were required to make it.

SERVICE STATION LIKE TEAPOT USES SPOUT FOR CHIMNEY

Teapot Service Station Attracts Attention and Proves Practical; the Spout Serves as Chimney

Novelty is the chief feature of a service station resembling a huge teapot, but the spout is also useful, for in the winter time it serves as a chimney. With the handle, it is made of clay and plaster of paris, while the outside of the building is of shingles.

BIRDS' WINGS EMULATED IN NEW SAILING YACHTS



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COLOR PHOTOS OF MARS RESULT IN NEW RIDDLES

Color photos have been enlisted on a large scale at the Lick observatory in an effort to solve some of the riddles of Mars. While new data have been gathered, still greater perplexities have resulted, for, among other things, the color pictures reveal that the Martian atmosphere contains a type of blue cloud with a composition that so far defies analysis, and this atmosphere probably extends more than fifty miles from the surface of the planet. The photographs were taken through the thirty-six-inch refracting telescope, enlarged and carefully studied, the use of ultraviolet and infrared lights enabling the photographers to show the planet with its atmosphere surrounding it like a blanket or "peeled away," reducing the interference. It has been established that the planet's atmosphere supports water-vapor clouds similar to those found above the earth and by means of the infrared-light photos, which penetrate the atmosphere, it has been determined, in the opinion of the scholars doing the work, that the "canals" on the surface of Mars are not optical illusions but are growths of vegetation and that the planet is some seventy miles less in diameter than was formerly supposed. More than 1,700 photographs were taken and enlarged in such a way as to increase the size of the observed planet about 800 times. The astronomers have made a new map of the body, using 150 photos, and propose to study it with the aid of motion pictures.

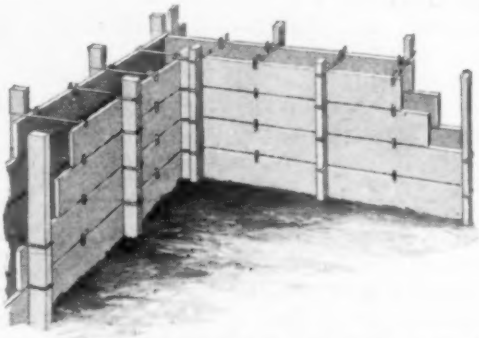
Riding the Paste "Bottle": Replica of the Dentifrice Container Used for Amusement Purposes at Beach

BIG TUBE GIVES BATHERS RIDE AND ADVERTISES PASTE

At a German seacoast town, an anchored tube, representing the container of a brand of toothpaste, afforded bathers amusement. It was placed where it would float at high tide and be visible to everyone at the beach when the waters receded.

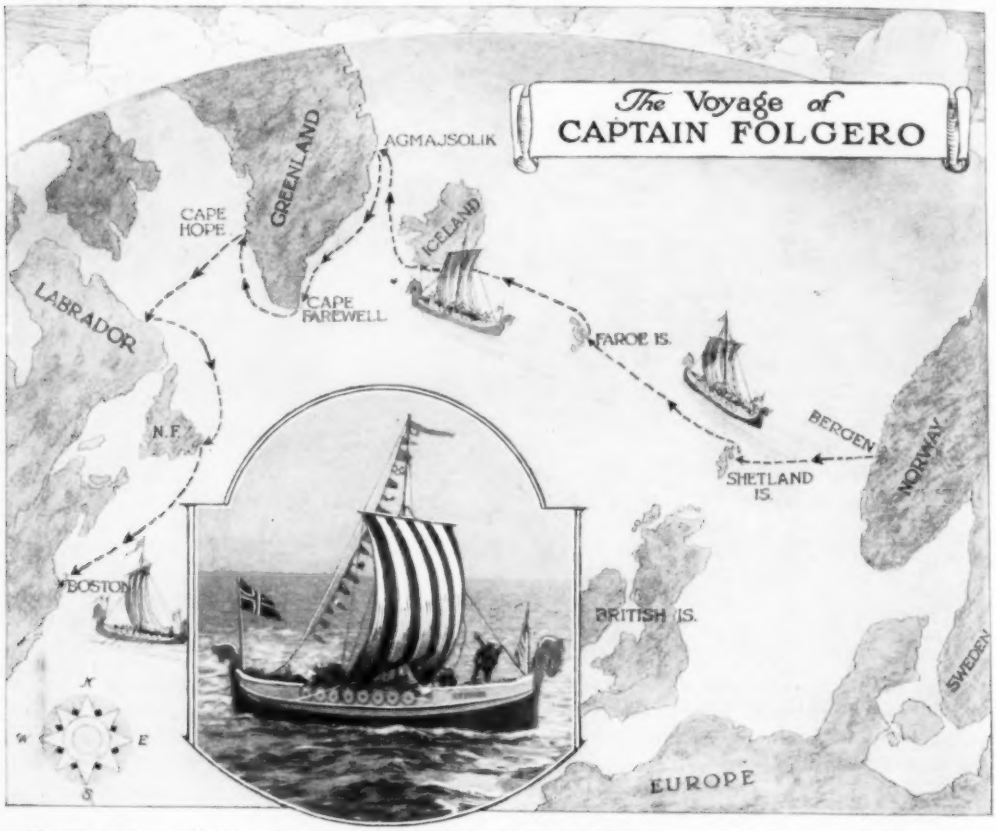
WALL TIE FOR CONCRETE FORM SAVES WORK AND COST

Cut-to-fit wall ties for binding concrete forms together have been placed on the market. The tie is essentially a piece of wire with lugs that fit over the edge of the form, saving the task of unrolling the wire, bending it around timbers and cutting it to the right length. With the ties, the studding can be alternated so that fewer uprights are needed. Since nails do not have to be driven into the forms, the life of the lumber is prolonged.



Concrete Form Fastened with Wall Tie That Is Quickly Adjusted and Saves Labor

MODERN VIKINGS PROVE ERICSON'S FEAT POSSIBLE



Voyage of the "Leif Ericson" across the Atlantic in the Path Followed by the Famous Son of Eric on the Voyage of Discovery That Brought Him to America

Two Viking ships, a Norse longboat of slightly more than eighty feet, constructed to the same size as one dug up in Norway fifty years ago, and a half-size replica met in Chicago recently as a result of a modern Viking's desire to prove not only that Leif Ericson's voyage of discovery to America was quite possible, but that it could have been done in a much smaller boat. The longboat was one built by Norway and sailed across the Atlantic many years ago for the World's Columbian exposition at Chicago. The half-size boat, forty-two feet over all, twelve feet nine inches wide, and drawing four feet of water, was sailed from Norway for the Philadelphia exposition, and then followed the route of its earlier and bigger prototype in a tour of the Great Lakes. Capt. Gerhard Folgero and three companions brought the little ship, with its single mast, its oars for calm weather and its rows of painted battle shields, across the western ocean by way of the Shetland and Faroe islands, Iceland, Greenland, Labrador and Newfoundland in twenty-nine days, battling gales and ice fields for a large part of the way. A sea anchor and a supply of oil bags, to smooth the worst seas, fresh water and provisions for three months constituted their chief equipment. From Bergen, Norway, they sailed to the Faroes, by way of the Shetland group, and were given a ceremonial welcome by the Norse community. Then they bore northwest to Iceland, where Eric and Leif, his son, lived, the small boat almost foundering in a terrific hurricane on the way. It took five days to reach Iceland, and after a one-day stop to replenish the oil supply, they set sail for Greenland. After reaching it and sailing

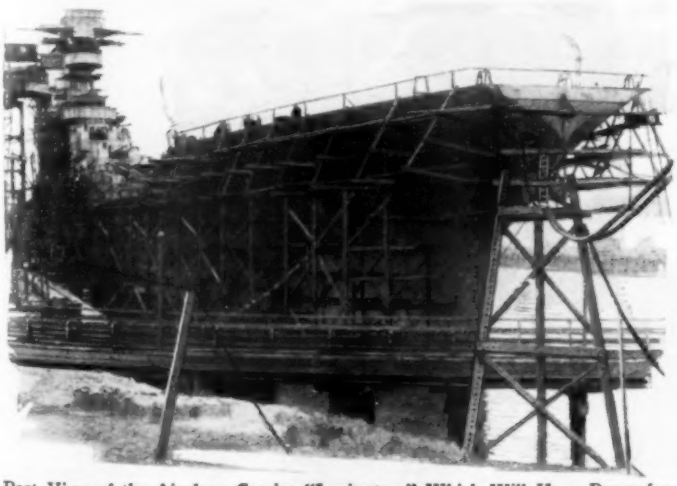
around its southern end, they crossed to Labrador, but ice blocked them, so eventually they had to go on to St. John's, N. F., before they could reach a harbor to rest and repair.

RAIL LAYER IS RUN BY ONE MAN

Operated by only one man, a rail-laying device, constructed by a section foreman of the Pennsylvania railroad, is said to do the work of twenty men. The outfit weighs but 400 pounds and was made from odd materials taken from the railroad yards. It is especially adapted to the placing of new rails where small crews are available. It is reported that, with the outfit and six men, the inventor has laid as many as eighty-two rails in a day.

CARRIER HOLDS EIGHTY PLANES AND COST FIFTY MILLION

Eighty airplanes will be accommodated on the carrier "Lexington," which is expected to be finished next January. It is 888 feet long, displaces 35,000 tons, will carry a crew of 1,700 men, and the cost is approximately $50,000,000.



Part View of the Airplane Carrier "Lexington," Which Will Have Room for Eighty Planes and 1,700 Men

Police Timing an Autoist with Aid of Periscope as He Drives through Tunnel; Speeders Are Pursued

PERISCOPES TO TRAP SPEEDERS AID TRAFFIC POLICE

Small periscopes, similar to those used in the trenches during the war, have been adopted by the Los Angeles police in a campaign against automobile speeders who persist in exceeding the limits while driving through tunnels in the downtown district. Concealed, the police can check the speed of the car through the instrument and pursue it, if necessary.

OVEREATING AFFECTS THE EYES STOMACH BALLOON SHOWS

By swallowing a stomach tube to which a small balloon was attached and inflated, a subject at the Rush medical college recently demonstrated to physicians how overeating affects the vision. Distention of the stomach produced results similar to those arising after eating a large meal. Within a few moments after the balloon was blown up, the subject became drowsy and extra effort was required to read. Examination of the eyes showed that vision was distinctly impaired.

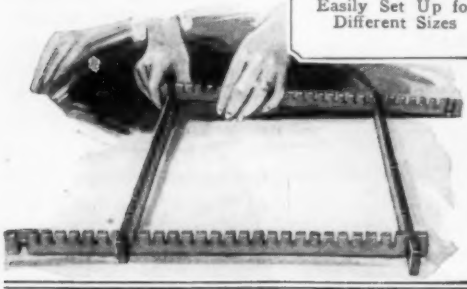
TIME and MONEY saving Things

It Saves Towels and Laundry Bills; Cleaning Glove for Dirty Hands Helps Remove Grease and Paint

Carpet Washer for Your Home; It Scrubs and Dries the Nap

Glass Clothes Sprinkler Distributes Water Evenly

Cotton-Tape Mop Head Will Not Drop Threads



Loom for Weaving Small Articles Is Easily Set Up for Different Sizes

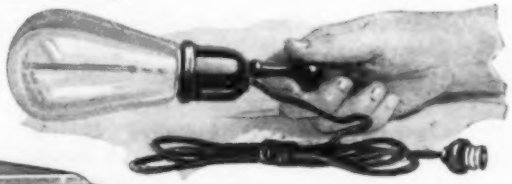
For Small Washings, Spring Outfit on Tub Does Work Thoroughly and Easily

for your HOME

Percolator, with Separate Base for Heating Other Liquids, Is Easy to Clean and Operates Quickly

Safe and Clean, This Household Incinerator Has a Spark Arrester at the Peak of the Stack, Is Lighted from the Top and Burns Contents Thoroughly

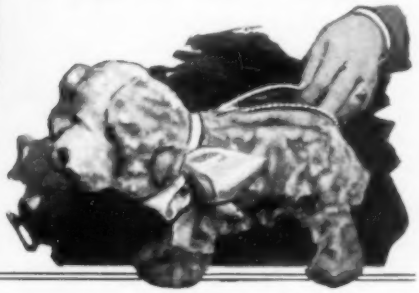
Something New in Candles for Tablecloth or Other Location; It Needs No Stick



Handle on Extension Electric-Light Bulb Simplifies Searching in Dark Closets and Promotes Safety

Inside This Attractive Cabinet Is a Five-Burner Gas Stove with Generous-Sized Oven and Broiler Space Underneath; Control Handles Are Back of Grill Work and Doors Open Downward

Puppy Purses with Quick-Closing Runner Clasps Please the Children; Pinch the Tail and the Doggie Whines



Sliding Body from the Auto Truck for Easy Unloading, and Rear View Showing the Gear That Moves the Body

AUTO-TRUCK BODY SLIDES OFF TO SIMPLIFY LOADING

To save time and make trucking easier, a California inventor has introduced an easily demountable body for motor units, somewhat like those now in use on freight and express trains. The power of the truck itself is utilized to slide the body, loaded or empty, upon a platform and readjustment is made by reversing the process. Small wheels on the body permit moving it around for ease in removing the contents or filling it and thus save hand trucking. Only a few seconds are required to remove the body or haul it on.

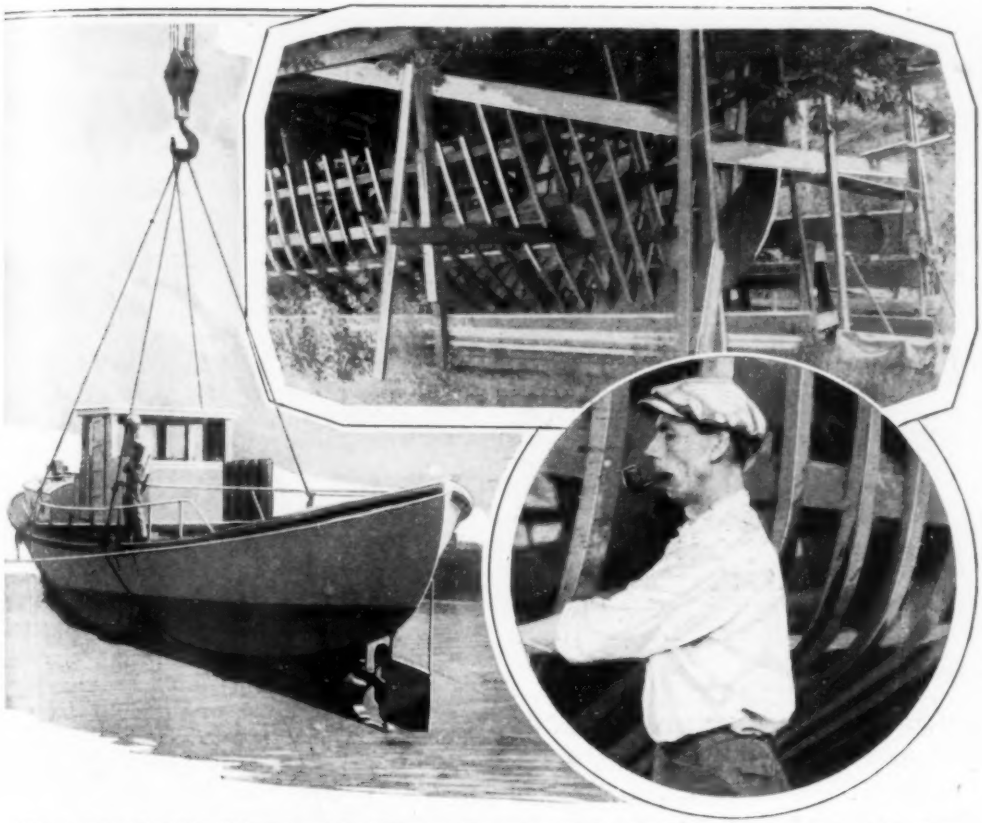
COCOA-ODOR FERTILIZER LATEST GARDEN AID

Fertilizers with unoffending odors have been prepared recently by the bureau of soils from the by-products of cocoa and other materials. Some 20,000 tons of the cocoa substance are produced annually in the United States. It is said to contain considerable quantities of nitrogen and is easily applied. Other fertilizers have been made from dried-crab waste, shrimp waste and bran.

ELECTRIC PUMP TO RESTORE BLOOD CIRCULATION

By means of an apparatus which circulates the blood artificially, a Vienna specialist has provided an effective unit, already successfully demonstrated in cases of drowning, heart failure, nervous shock and like instances of temporary cessation of normal life functions. It is said to overcome one of the chief difficulties that has defeated previous attempts in this direction, that is, getting the blood back into the heart. In the new apparatus, this is accomplished by simultaneous mechanical stimulation of the abdomen, the lungs and the heart, resulting in restoration of the activity of the heart, arterial system and lungs at one and the same time. The outfit is portable and may be operated by electrical current from regular circuits or by a special motor. It has been designed especially for life-saving units of all kinds and has been successfully demonstrated.

Using the Pump Which Circulates Blood Artificially, to Aid in Reviving Persons Nearly Dead



Views of the One-Man Shipyard and Its Operator; Part of an Unfinished Ship, Launching One of the Craft, and Mr. Hoffman at Work; Seagoing Vessels Are His Specialty

MAKING SHIPS IN BACKYARD PROVES PROFITABLE HOBBY

A backyard in the outskirts of a large city is not the place you would expect to find a shipbuilding plant, but such is the location of one at Portland, Oreg., which has turned out four seagoing motor fishing boats and has construction of the fifth under way. The enterprise is conducted wholly by one man, Samuel Hoffman, who has been building ships as a hobby for fifteen years. A carpenter by trade, he gives his spare time only to the boats and thinks nothing of devoting two or three years to a single ship. The trawler he is now building will have cost approximately $10,000 when it is finished. Its ninety ribs are of eastern white oak, the boat is forty-two feet long, with an eleven-foot beam, and will be equipped with a thirty-horsepower motor. When the boats are finished, they are taken by house movers to the Willamette river, a distance of five and one-half miles, and launched by crane for the journey to the Columbia river and out to the sea.

HEATER UNIT HELPS START CAR AND SAVES GASOLINE

Adaptable to all makes of automobiles, or to other combustion motors, a heating system forces an air current at some 300 degrees Fahrenheit into the intake manifold to simplify starting the engine. It consists of a small motor and fan, the air being driven over an electrically heated coil through a flexible tube into the manifold. The necessary energy is derived from the storage battery.

Removing Rivets with Cutter That Has Shield Attached, and Close View of the Guard

RIVET-CUTTER SHIELD REDUCES LABOR AND AIDS SAFETY

In removing rivets from steel cars and other units, two men generally are required, one to shield and catch the rivet head while the other operates the cutter. With a wire net, which fits on the end of the cutting hammer, the danger of flying heads is eliminated and only one man is needed, an additional advantage being that workers can operate directly opposite each other without danger.

"POCKET" BALLOON CARRIES MAN 300 MILES

Weighing but fifty pounds, a twenty-foot balloon recently carried a man from New Jersey to the Adirondacks on a 350-mile overnight trip. He landed near a railroad station, emptied the bag of its 4,000 cubic feet of hydrogen, packed the balloon on his back and walked to a train. He had sufficient gas and ballast to have gone 250 miles farther, he declared. The pilot's car was just large enough to hold one man and carried him standing.

LIGHT CELLS AS POLICEMEN TO REGULATE TRAFFIC

As a substitute for the usual system of stop-and-go lights to regulate automobile traffic, an attache of the bureau of standards has developed a means whereby the cars themselves actuate the signals to eliminate unnecessary delays and clear the road which is open to traffic at the proper time. An essential unit of the installation is a light-sensitive cell in the center of the street, not far from the intersection, and exposed to rays from a spotlight shining directly opposite to it. An automobile passing between the cell and the spotlight, and thereby interrupting the rays, would cause the cell to operate a relay controlling the traffic signal. For instance, a car approaching the sign would set the stop signal, halting traffic on the intersecting highway. The sign remains on for a few seconds to allow the following cars to pass, so long as they intercept the light beam on the sensitive cell in time to prevent the signal from changing against them. An advantage claimed for the system is that no one street is favored over another but both are controlled according to the actual demands of the traffic.

Drawing to Illustrate Operation of the "Light Cell Policemen" at Intersections; Cars Interrupt Beams from Beacons to Actuate the Signal

Government Food Tasters Putting On an Ice-Cream Eating Contest, and Getting Paid for It; Their Jobs Require Acute Development of the Senses, and Few Can Qualify

How Uncle Sam's Food Testers Help You

Glass Stomachs and Rats Also Are Used to Determine Nutrition Value of Different Table Products

By C. MORAN

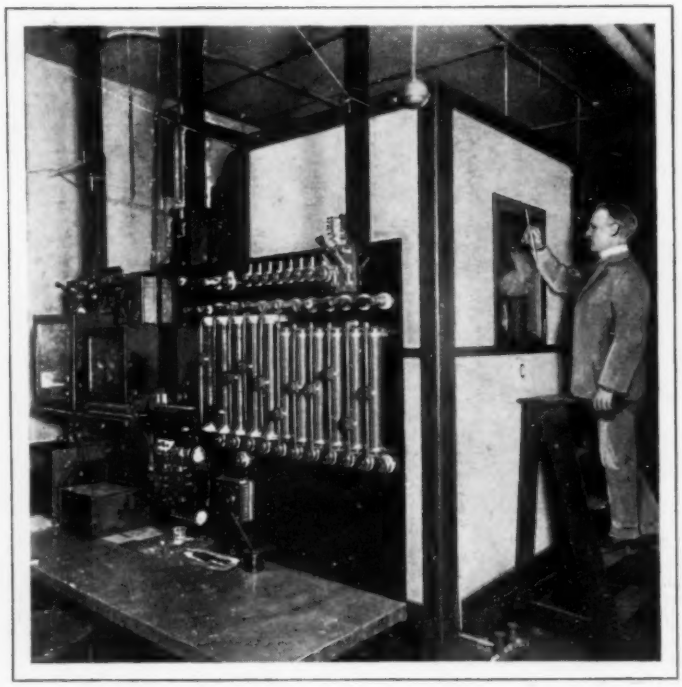
UNCLE Sam now has a staff of official food tasters at Washington whose job it is to determine the palatability of foods cooked in the experimental kitchens of the department of agriculture. Glass stomachs are used to determine digestibility of foods and rats to demonstrate body-building factors, but only the human palate can determine palatability, which is regarded now by the government scientists as of high importance in food-value determination.

Food tasters are department officials who score the food for taste, tenderness, flavor and other palatability factors. Ice-cream tests were made recently in which the officials were required to eat their fill of ice creams made in different ways. There was a decided preference for rich, sweet and firm ice cream.

Another tasting experiment recently was of 100 legs of lamb from animals commonly bred in the western range states. These animals had been produced at the government sheep-experiment station at Dubois, Idaho; they were fattened at Purdue university, and slaughtered at the government experiment farm at Beltsville, Md.

Twenty-five legs from each of four different breeds were cooked in the department's experimental kitchens, in lots of eight, in temperature-controlled ovens. Five judges scored the cooked meat, the tests resulting in specific recommendations as to better production methods to satisfy consumer demands, and in a standard method of cooking lamb with a maximum of palatability and a minimum of labor and fuel consumption.

Department experts say there has been an unfortunate tendency among students



In This Air-Tight Chamber, the Body Heat and Energy Developed by Measured Amounts of Food Products Are Determined

of nutrition to underestimate the importance of palatability, individual preferences and family customs, but the question of how foods go together, from the standpoint of taste as well as from that of body building and health, must always be kept in mind. The human palate seeks variety of flavor and also differences of texture.

Many food customs have been formed in response to instinctive requirements of the body. In early days, people gathered wild herbs and greens of various kinds, but not until very recently was it known that these foods provide an important dietary principle necessary for health. The instinctive demands of the human body, in a less fertile and prosperous country, might have led finally to the custom of satisfying body needs by means of simple, palatable meals, but, as a matter of fact, it is not unusual for a meal to provide several starchy foods, several animal protein foods and several fat foods, which means waste of materials and labor.

The so-called "vegetable plate" has received much attention in the government food kitchens, where a "panning" method has been developed, consisting in cutting the vegetables into small pieces and cooking them in a flat pan on top of the stove with a minimum of water, to which a little fat has been added to prevent the vegetables from sticking to the pan. The water tends to evaporate and it is often unnecessary to pour any of it off.

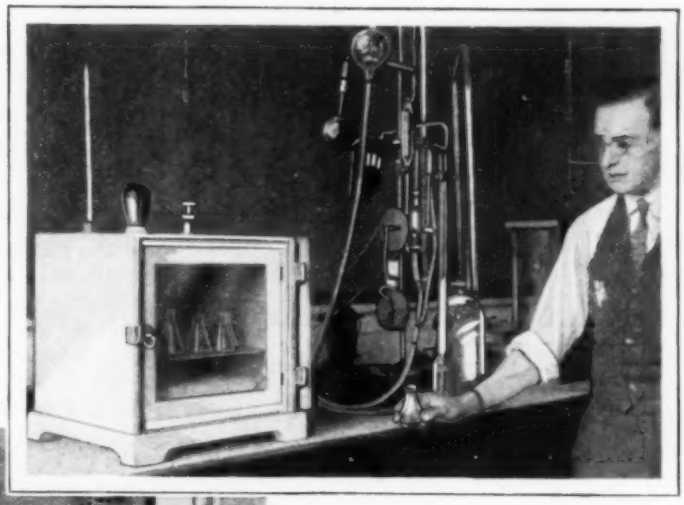
Many new recipes and new cooking methods have been developed by the food tasters. They found in beef-tasting experiments that successful results in roasting beef are obtained by a preliminary searing at 250 degrees Centigrade, and then lowering the temperature to 125 degrees Centigrade for the remainder of the cooking period. The time of cooking may be shortened by cooking at 150 to 175 degrees, but the evaporation and dripping losses increase and there is less uniformity of "doneness" as compared with meat cooked at the lower temperature.

The results of the food-tasting experiments are being related by the department to production and marketing problems. Food habits in this country have changed markedly in the last few years, consumption of wheat and meats having decreased with a corresponding increase in consumption of fruits and vegetables. Department figures show that the consumption of the latter commodities in New York city alone has increased more than twenty per cent in the last five years, whereas the city's population increased less than four per cent during the same period.

An official tea taster for many years has been employed by the department. His job is to brew tea from samples taken from imports. This official now is making a series of experiments to determine whether the flavor of tea is affected by the type of containers in which it is packed. The department also has a corps of butter tasters who inspect and grade creamery products.

The palatability tests are a part of the

department's recent activities to determine consumer preferences for different food products and grades of foods. Nationwide surveys have been made of the consumer demand for milk, meats, fruits and vegetables, the latest survey dealing with prunes. The investigators interviewed housewives in scores of cities and learned, among other things, that housewives do not know there is more than one kind of prune. The survey dealt with the so-called Italian prune, which is a sour product grown in the northwest.



At the Top Is a Glass "Stomach," in Which Government Chemists Test the Digestibility of Foods, and at the Left, Below, the Ice-Cream Plant

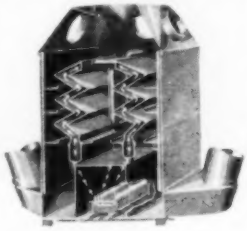
The department's survey of meat consumption revealed that housewives know only two or three cuts of meats, whereas an animal carcass provides a dozen or more.

SPEED GROWTH OF MUSHROOMS WITH ARTIFICIAL "STORMS"

"Synthetic" electrical storms are produced in Pennsylvania cellars to speed the development of mushrooms. The disturbance creates ozone in the air which is favorable to the rapid maturity of the growths. A public-service company recently found that there are 8,400 uses to which electric current has been put. It is employed to operate delicate measuring instruments at the government aeronautical testing laboratories, in Virginia; it is harnessed to churn butter which is unchurned again by electricity to make cream; orchardists and gardeners are using it to lure insect pests which are trapped in pans of oil under electric lights; beauty experts run reducing machines with it and the dentist makes use of it to run his drills.

GAS FURNACE FOR HOME REDUCES COST

The many advantages of gas for heating purposes long have been recognized and, to utilize it still further, a special furnace has been devised. Burners are of the Bunsen type and air, heated to a high degree, passes through large steel chambers on each side of the combustion area to extract every usable degree of heat from the gas consumed. A horizontal flue at the top leads into the chimney. An additional feature is thermostatic control to regulate the flow of gas and maintain a more even temperature.



To Protect the Foundryman from Burns; Pouring Ladle with Sliding Wooden Handle

SLIDING-GRIP FOUNDRY LADLE GUARDS HANDS FROM HEAT

Equipped with a sliding wooden grip, a ladle used for skimming the slack from molten iron in foundries, enables the user to avoid discomfort and possible burns by having the hand too close to the metal. The handle is quickly adjusted to any position and permits obtaining a firm hold.

BULLETS LEAVE TRACK OF FIRE TO AID TARGET PRACTICE

With bullets that leave a glowing mark to indicate their path, successful machine-gun practice has been conducted by army units. The tracers showed the rebound as well as the path to the target, as illustrated in the accompanying photograph.

OIL WELLS TAMED BY CEMENT APPLIED BY NOVEL PROCESS

Back of the vast oil industry lies an interesting story of a young man's victory over one of the most perplexing problems of well construction, the task of properly reinforcing the deep holes to support the casing and keep out water. Credit for one of the most effective ways of doing this is given to Erle Palmer Halliburton, who, in the last seven years, has patented many devices to simplify and improve engineering methods in the oil fields and who has treated 12,000 wells without a single failure. The feature of Halliburton's scheme is that he virtually makes the oil well "cure" itself. How to introduce cement between the earth walls of the well and the casing—a string of pipe from a quarter to a mile in length, often times presenting obstacles forbidding the mere pouring of the material between the sides—was his problem. He devised two wooden plugs. One was forced into the casing and cement "slush" pumped on top of it. As the weight increased, the plug slid down inside the pipe and finally fell into the "dead

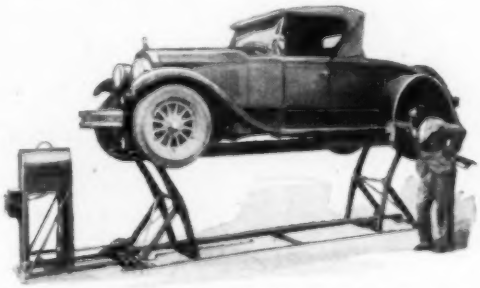
Night Photograph of Target Practice with Glowing Bullets; Course of Projectiles to the Mark Is Plainly Indicated and One Bullet Registered as It Glanced Away from the Surface

end" of the hole when the bottom of the casing was reached. This allowed the cement to pour in upon the oil sand, which has the peculiar characteristic of resisting any such intrusion, forcing the foreign material upward between the casing and the walls of the earth. The rising mass of cement, carried ahead of it the mud and water accumulated between the pipe and the earth. To introduce the necessary quantity of cement quickly, Halliburton invented a combination pump and cement mixer mounted on a four-wheel-drive truck that could be taken anywhere about the oil fields, in all sorts of weather. A mechanical measuring device was also adapted to determine, to a fraction of an inch, the exact quantity of cement that had been forced between the casing and the earth.

Windmill Boat for Trip across the Atlantic; the Wheel Is Geared to a Small Propeller

VERTICAL-LIFT AUTO ELEVATOR SAVES GARAGE SPACE

Several desirable features are claimed for an electrically operated elevator for repairing or servicing autos. It requires no special foundation and raises the car vertically, saving space. It may be stopped at any height desired, suspends the auto at four points and lifts it by the axles, leaving the wheels free. The hoist has a capacity of 6,000 pounds, and may be raised to a height of four feet or lowered to seven and one-half inches. Controls prevent accidental dropping of the load.



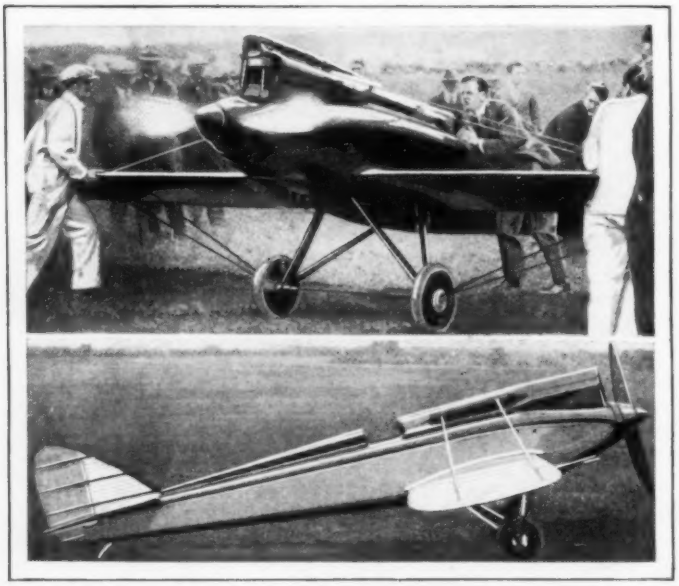
Car on the Vertical Hoist Showing How It Stands in Convenient Position for Repairs

SMALL BOAT RUN BY WINDMILL BUILT TO CROSS ATLANTIC

To cross the Atlantic in fifty days, or less, is the object of two English adventurers who propose to make the journey in a twelve-foot boat without steam, sails or oars. Propulsion will be afforded by a windmill geared to a propeller and the wheel is to be turned by the wind.

QUARRY IS MADE INTO GARDEN AROUND CEMENT PLANT

One of the sights in the suburbs of Victoria, B. C., is a limestone quarry changed into a lawn with shrubs and rock gardens. As an example of landscape architecture, it well illustrates the possibilities of decorating commercial-plant grounds.



Nicknamed the "Flying Pencil" Because of Its Unusual Streamlined Appearance, a New Light Plane Produced in England

MIDGET HIGH-SPEED AIRPLANE HAS EIGHTY-HORSE MOTOR

A plane with an engine of only eighty horsepower, yet capable of making 175 miles an hour, was given its first trial in the recent King's cup races in England. Designed by Maj. DeHavilland, whose ships were standard equipment in the U. S. army and air-mail service for some years after the war, it is a low-wing monoplane, the wing being placed below the body instead of above it, as is the more common practice. Built to carry a single passenger, its appearance is unusual because of the way in which the streamlining of the body has been carried out, even the projecting head of the pilot being streamlined through a projection tapering back to the tail. Because of this design, the little craft is thirty to forty miles an hour faster than the British army's single-seat fighting planes, which have 400-horsepower engines. Its performance emphasizes the fact that much of the excess power of big engines for planes is utilized in carrying their own weight.

SAWDUST-CEMENT MIXTURE MAKES LIGHT LUMBER

Chemically treated sawdust and cement are mixed together to form a material which is said to weigh about half as much as ordinary concrete, has a better wearing surface, high fire-resistance and insulation properties and can be sawed, nailed or screwed, and painted or polished like wood. It is being successfully employed in precast units for many purposes, and numerous tests have showed that it has great strength and durability in this form.

SPEED BOAT MADE OF RUBBER WON'T GET WATER-LOGGED

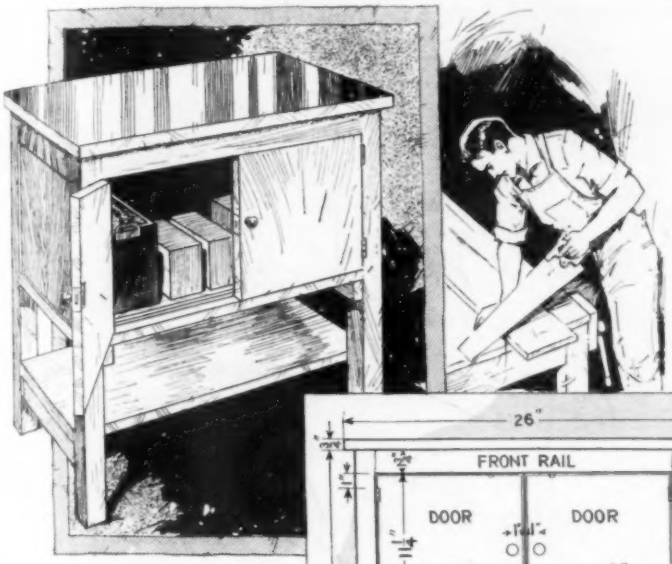
Successful tests are reported with an all-rubber speed boat, the hull of which is constructed of the recently introduced "rubber lumber," devised especially for airplane use. This material consists of thin sheets of hard rubber with a central core of sponge rubber. A fabric or metal covering may be added if desired. The boat was lined on the outside with a soft-rubber cushion, fastened to the hull by a special process, to make it water-proof and resistant to shocks. Since the craft cannot become water-logged, it has the advantage of greater speed over boats of similar size, type and power.

Rubber Speed Boat Carries Four Persons with Ease and Does Not Lose Its Buoyancy

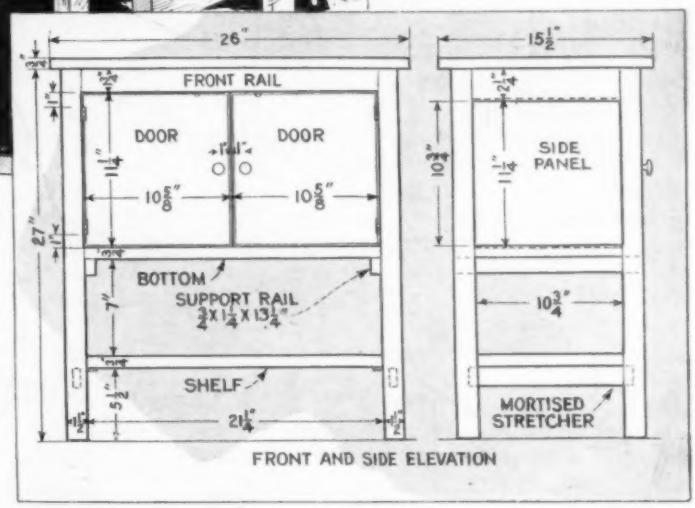
Radio Cabinet Table Built for Less Than Five Dollars

By GABRIEL J. ISSAKOFF

A SUBSTANTIAL radio table, which can be built for about $4.50, solves the problem of disposing of unsightly batteries and provides an excellent support for the set. It is designed along plain lines, and the builder can use his own ingenuity in decorating and finishing, the usual stains and varnishes being suitable, or any of the popular colored lacquers and transfer designs. Very few tools are necessary, and the dimensions given may be varied to suit individual requirements without change in the general construction. The table illustrated is 27 in. high, with a top measuring 15½ by 26 in., which size will accommodate the average receiving set and batteries. The lower shelf provides space for books and magazines, but may be omitted and a stretcher or scroll design substituted if desired.



Above, Completed Cabinet Table with Batteries in Position; Right, Front and Side Elevations

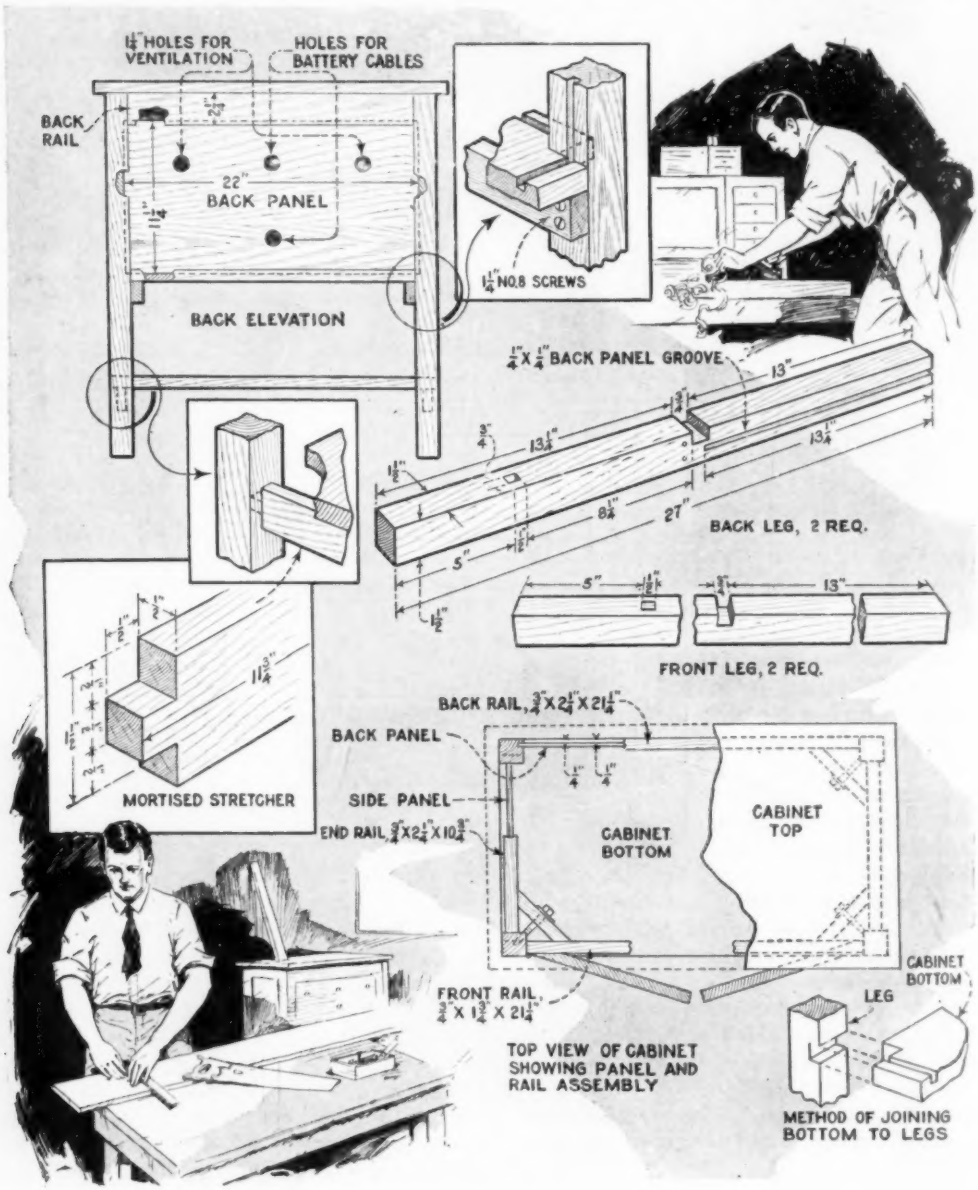


Any wood may be used; in this case white pine was employed and contributed to the low cost. Birch, poplar or hardwood, although more expensive, takes a better finish; whichever selected, the stock should be thoroughly seasoned, clear and straight-grained. The rough sizes of the material required may be obtained from the local mill or the lumber dealer.

Mark the various pieces to indicate their positions. Select the best surfaces for the faces, mark each to avoid mistakes, and lay out the work from these sides only. Pieces like the stretchers and legs, shown on page 1002, should be finished at the same time. Lay them out, clamping them together for similar details, like notches and mortises. Make the two stretchers first, laying out the tenons and cutting them with saw or chisel; the legs are next, planing them true to size, laying all faces together, with ends even, and clamping them securely.

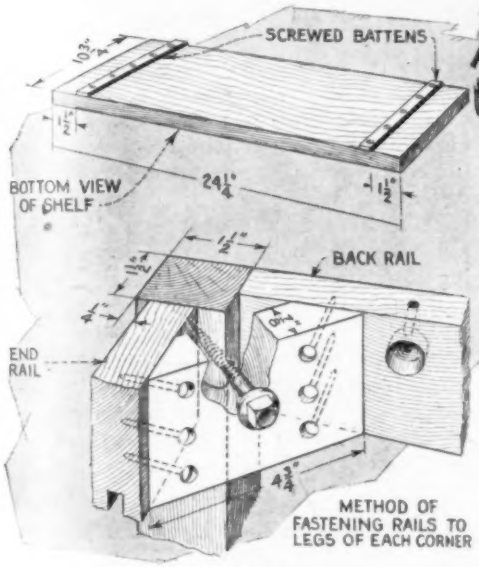
Mark the length and width for the blind mortises to fit the tenons on the ends of the stretchers and also the notches to receive the bottom board for the cabinet. The two back legs have grooves, ¼ by ¼ in., to take the back panel. The shelf and corner-block details are shown on page 1003. To bore the holes for the screws in the corner blocks, use a drill a trifle larger than the smooth shank of the screws. The holes in the legs are drilled smaller than the threaded part of the screw; use washers, and soap the screw threads before inserting. To fasten the cabinet top to the rails, bore several holes on the inside of the rails, as shown in the sketch at upper right. These holes are located an inch or so from the top and slant down for the screws.

To put on the top, lay it face down on the bench, as shown in the same sketch, place the rails in the proper position, and



screw them to the underside of the top. Do not overlook the two supporting rails under the cabinet bottom, as they help to brace the legs and add strength to the cabinet bottom.

The two doors, 10⅝ by 11¼ in., shown in the front elevation on page 1001, may be ornamented by grooves or carved de-



Above, Method of Drilling Holes for Screws to Fasten Cabinet Top to the Rails; Left, Details of Shelf

signs if desired. Inexpensive "carved" designs, made of pressed wood, for the doors may be obtained from your local cabinetmaker and glued in the center of the doors, or if the lacquer finish is used, suitable transfer designs are very effective. Ventilation holes and battery cable outlets, shown at the upper left on page 1002, are drilled in the back panel of the completed assembly. The entire surface should then be well sanded. For those who prefer the wood stain, the directions given in the May, 1927, issue of Popular Mechanics Magazine, on page 842, can be followed with good effect. If a dark or red-mahogany finish is desired, use a good penetrating oil stain of the color selected, and let it dry at least 24 hours, then sand the surface. It is best to try out the stain on a piece of wood of the same kind as the cabinet first, as some stains change their color on different woods. Use mahogany glaze color for the next coat, and let it dry overnight. Finish with fine sandpaper or rottenstone, and apply a number of coats of any good standard varnish, sandpapering each coat after it has thoroughly dried. For a dull effect, rub down the last coat with rottenstone, wipe carefully and apply furniture polish.

MATERIAL LIST

1 piece, ⅞ by 15¾ by 78 in.
5 pieces, 1¾ by 1¾ by 27 in.
1 piece, ⅞ by 2¼ by 20 in. (hardwood, for corner blocks).
1 piece of sheathing board, for rails. (When dressed on two sides it should measure ¾ by 2¼ by 66 in., and one edge should be grooved ¼ or 5-16 in. deep and ¼ in. wide to take the panels.)
1 piece, three-ply, ¼-in. stock, 22½ by 21½ for panels.
1 piece, ¾ by 11¼ by 22 in., for doors.
3 doz. 1¼-in. No. 8 flat-head wood screws.
4 ¼-in. square-head lag screws, 2½ in. long, with four washers.
2 small round-head door knobs with screws.
4 1-in. brass or steel door hinges with screws.
2 door catches with plates.

Rate of Drop in Idle Batteries

Both dry and wet batteries will run down when permitted to remain idle. The rate of discharge is about one-third that of the discharge when in active use. B-batteries are now stamped with a date limit, like films, to guarantee fresh stock, and the buyer should look for this date to protect himself.

Unit Ready for Use and with Front Removed; Right, Rectifying Unit About One-Half Actual Size

New Battery Charger Is Dry

A new battery charger using no vibrating parts or liquid is now available, the current being rectified through an electrochemical process. With this type of charger, no hazard to rugs or woodwork is possible, as there is no acid to spill. The charger is so designed that the tubes are safe even if turned on when the charger is in operation. Only 2¾ in. wide, 5¾ in. long and 4¾ in. high, the charger fits into the battery compartment of the usual console. The rectifying element, shown in capsule form, is held in spring clips like a cartridge fuse and can be easily replaced. The rectifying unit is guaranteed by the manufacturer for 750 hours of full-load operation, or approximately one year's service, while the transformer will last indefinitely. The charging rate is two amperes.

Testing Transformers and Condensers

Audio transformers and condensers can be most accurately tested with a voltmeter; the use of headphones for transformer testing often leads to false impressions owing to the inductance between two parts of a broken coil. Connecting the voltmeter in series with a transformer winding and a B-battery, the reading will be lower than the battery voltage because of the resistance of the winding. If there is a break in the coil, no reading will be obtained. The primary and secondary windings of a transformer which is not marked at the terminals can be determined by means of the voltmeter and battery. The secondary winding will cause a greater voltage drop than the primary, due to its greater resistance. To determine the amount of charge a condenser is capable of holding, connect the condenser directly across a battery to charge the plates, remove the battery connections and connect the voltmeter across the condenser. The degree of the needle's deflection, which will immediately drop back to zero as the charge is dissipated, indicates the comparative charge-retaining capacity of the condenser. To test a condenser for a short circuit, connect the voltmeter in series with the battery and condenser terminals; a sustained deflection of the needle indicates a shorted condenser. If the condenser is efficient, the needle will swing over and return to zero immediately.

Broadcasting Time Card

Time and trouble are saved by condensing the usual radio programs on the time card shown in the illustration. A piece of cardboard, about the size of a postal card, is ruled as shown and the time divided into fifteen-minute intervals from 1:00 p. m. to 12:45 a. m. The features you wish to listen to are selected from the newspaper programs and the call letters entered on the card opposite the time given. The dial settings may be substituted for the call letters if desired.

RADIO PROGRAM

1:00 WGN	7:00
1:15	7:15 WHT
1:30 WMAQ	7:30
1:45 WQJ	7:45
2:00 KYW	8:00 WGN
2:15	8:15
2:30 WGN	8:30
2:45	8:45
3:00	9:00 WMAQ
3:15	9:15
3:30	9:30 WQJ
3:45	9:45
4:00 WJJD	10:00
4:15	10:15
4:30 WGN	10:30 CNRC
4:45	10:45
5:00	11:00 KFI
5:15 WMAQ	11:15
5:30	11:30
5:45	11:45 WSB
6:00 WLS	12:00
6:15	12:15 WLW
6:30	12:30
6:45	12:45 WDAF

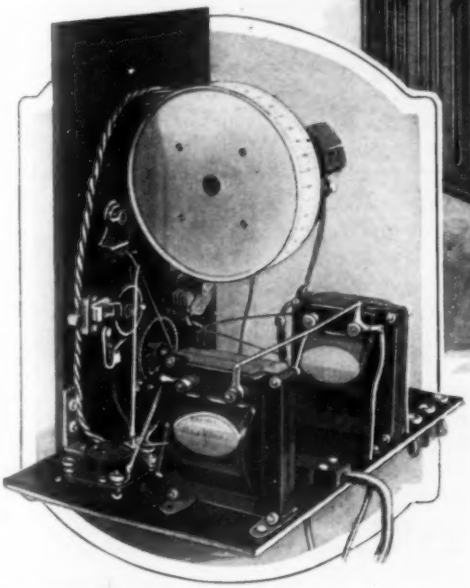
Loop Set Built In for Cabinet Speaker

Power Amplification, Simplicity of Control, Splendid Tone and Volume Make This Set Ideal for the Music Lover

By FRANK L. BRITTIN

EXAMINATION of one of the new exponential horns, housed in a console cabinet, suggested the installation shown in the photo below. There is ample room in the cabinet for storage battery, charger and combination B-eliminator and power amplifier, and even with this, there is still sufficient space for a compact three-tube receiver. The same general arrangement may be adapted to a phonograph console if desired, or built up in separate units for use with speakers of any type. In designing this set no attempt was made to obtain long-distance reception; it is simply a local broadcast receiver employing only high-class parts, and devoted to tone quality, selectivity and simplicity of control. Easily adjusted from a whisper to volume sufficient to fill a large auditorium if desired, this set is for the music lover located near any of the large broadcasting stations.

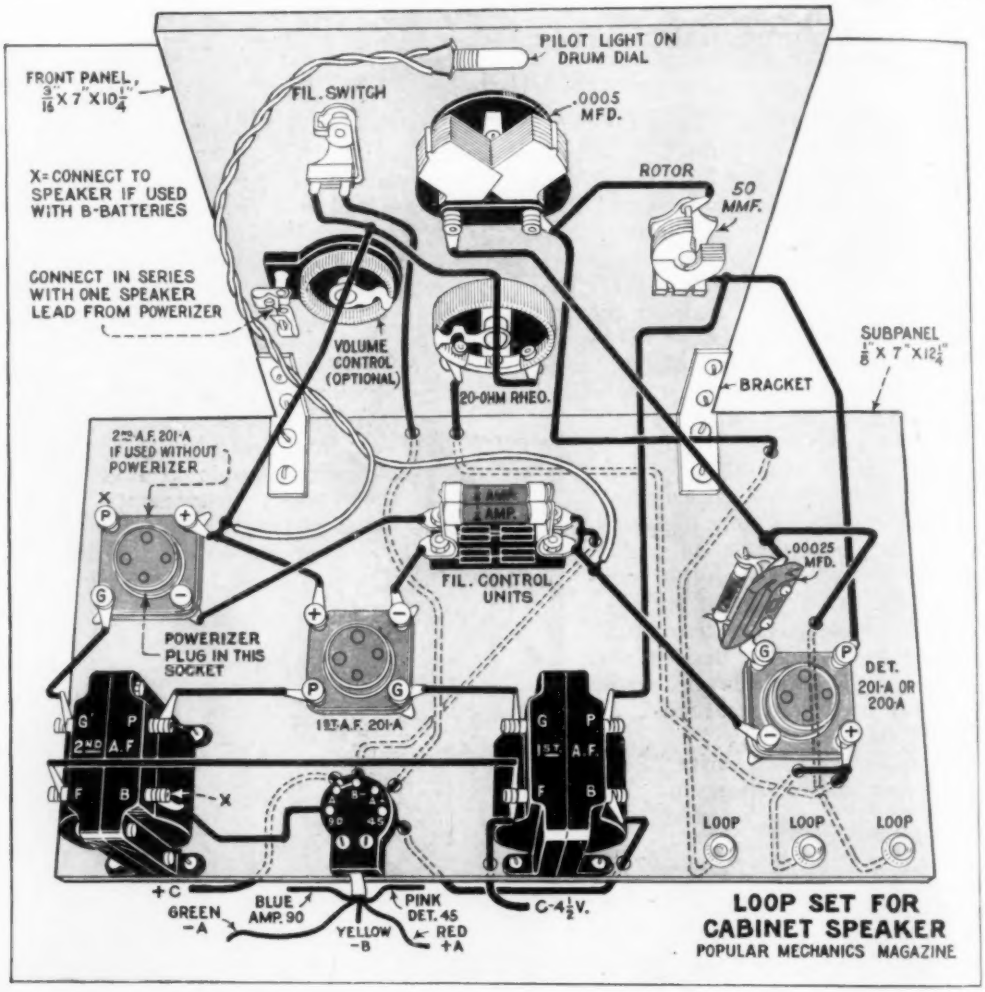
Equipped with "powerizer" for power amplification and B-elimination, and automatic relay switching over to trickle charger when the set is turned off, it is practically an electric receiver, and as it is operated on a standard three-tap loop, the receiver is very selective and comparatively free from static and local interference. The circuit is very similar to the one described in the December, 1926, issue which has been very popular with our readers and is especially suitable for this type of installation. The detailed wiring diagram and several photos show the extremely simple arrangement of the various instruments on the panel and subpanel. The wiring should be run as nearly as possible like that shown in the diagram. The dotted lines indicate flexible leads that are run below the subpanel, and which are taken directly from point to point in the actual wiring. The



Cabinet Set in Operation, Showing Ease of Control; Left, Receiver Removed from Cabinet

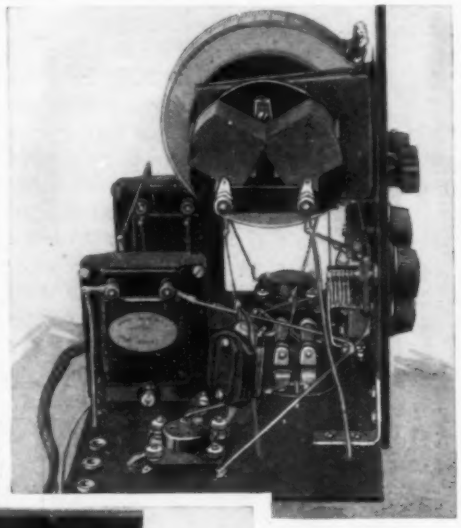
Copyright, 1927, Popular Mechanics Magazine

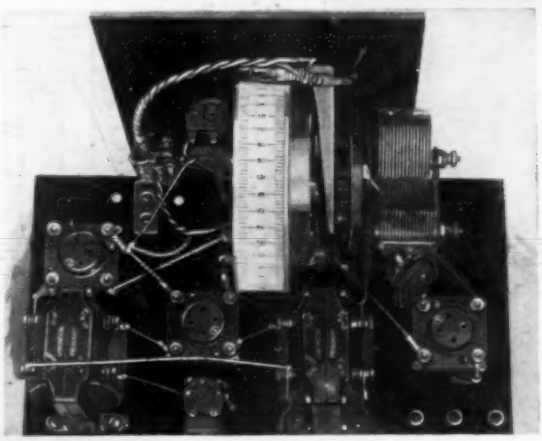
sockets are of the spring-suspended type, and this is especially important at the detector tube. High-grade heavy a.f. transformers are used, the filaments of the amplifier tubes being controlled by automatic units. The set is complete in every way for use without powerizer, if desired, and with standard B-batteries.

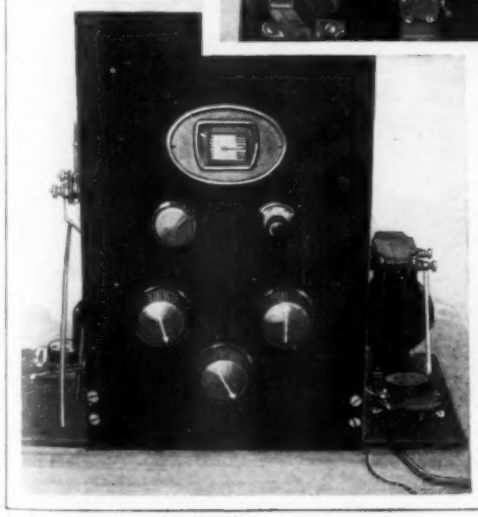


The front panel is mounted on the subpanel by means of two angle brackets, and the entire set is supported inside the speaker cabinet on two black japanned shelf brackets, screwed to the underside of the subpanel. The front-panel assembly is very simple, and may be arranged to suit the builder. Assembling the instruments the long way of the panel makes a neat appearance at the side of the cabinet, and provides ample room for all controls. Either drum or standard dial for the .0005-mfd. variable condenser may be used; on the detailed wiring diagram the drum-dial mount was omitted, to simplify the layout. However, the mounting details are shown at the upper left on page 1008. The 50-mmf. midget condenser at the right is rotated by means of a small knob and, when once set, needs very little readjustment. The volume-control device, shown at the left, is optional and consists of a special variable resistance. At this point it will be well to explain that if the set is to be used without the powerizer and with standard B-batteries, an open-circuit jack may be mounted in the position occupied by the volume control.

Extra leads run from the P-post marked X, on the second amplifier-tube socket, and the B-post marked X, on the second a.f. transformer. They are soldered to the jack terminals, and the speaker is plugged in at the front. If an inside connection from the speaker is desired, the leads may be taken to two extra binding posts which may be mounted at any convenient point at the rear of the subpanel. If the combination power amplifier and B-eliminator is used, no extra leads are required at the points marked X, as these connections are all automatically taken care of by the plug from the powerizer unit, which is plugged into the second a.f.-tube socket, and the loud-speaker connections are taken directly from the powerizer unit, as shown in the lower diagram on page 1008. In this case, note that one of the loud-speaker leads is cut and the volume-control device inserted in series. Rather than cut the speaker lead, which is difficult to connect if this is done, use an extra phone cord of the single-phone type. Metal tips are provided on both ends, and the extension may be made by means of extra double







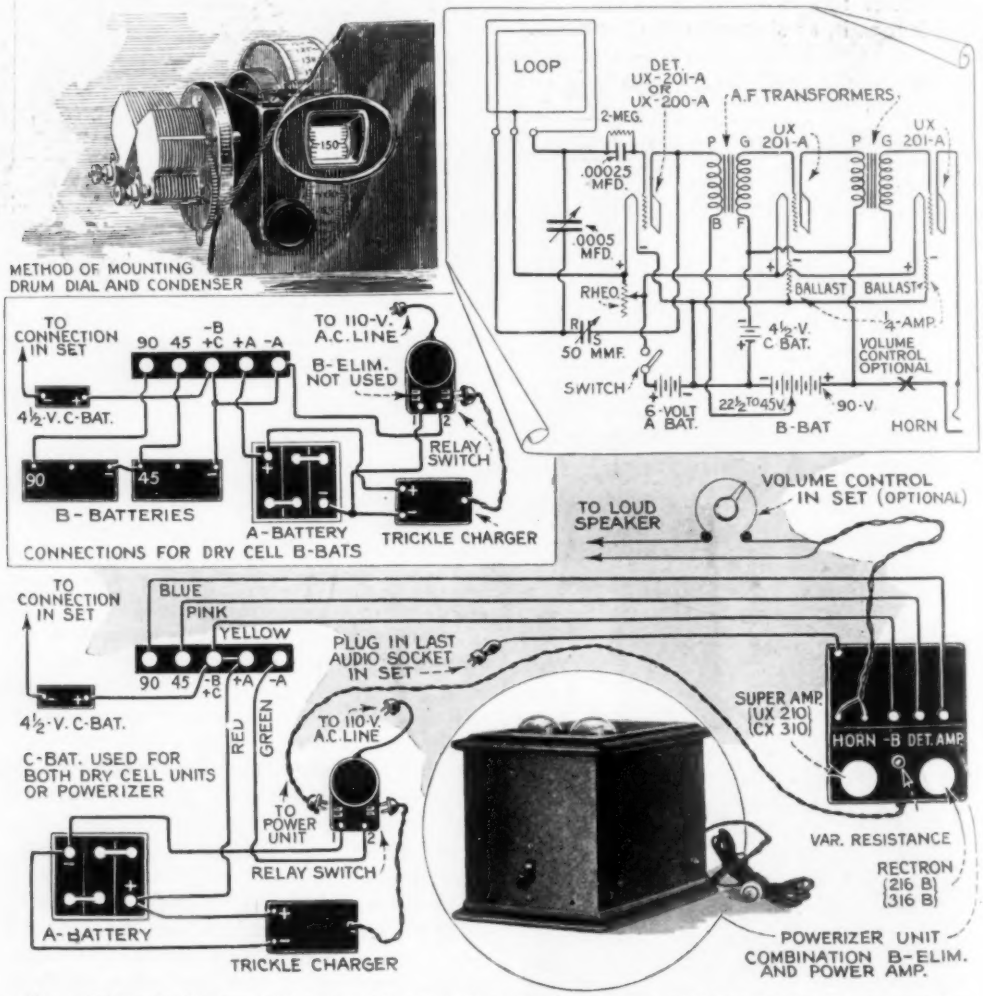
Above, Side View, Showing Location of the Detector Tube and Loop Jacks; Left, Rear View; Below, Front View of Panel

Fahnestock clips screwed to the inside of the cabinet at any convenient point. These clips are also used on the volume-control unit for quick connection. The speaker lead from the powerizer through the volume control is run through to two holes drilled in the subpanel directly below the volume-control unit, not shown in the detailed wiring diagram.

The B-battery cable terminates in a bakelite lug mounted at the rear edge of the subpanel; each terminal connection is identified by a color corresponding to the colored wire leads running to the various batteries. Note that the A-negative and B-negative terminals of the lug are connected, and that an extra lead is taken to the positive of the 4½-volt C-battery from the same negative connection. The

negative terminal of the 4½-volt C-battery is connected to a flexible lead and taken to the two F-posts on the a.f. transformers; this is the only connection independent of the battery-cable lug. Individual binding posts may be used instead of the battery cable and lug, but the builder will find this device very convenient. Carefully note the three loop jacks at the rear of the subpanel in the detailed wiring diagram; the center loop jack must always be connected to the center lead from the loop, or the set will not work efficiently. The photos on page 1007 give the reader a clear idea of what the finished set looks like from various angles. The lower photo of the front panel shows the neat arrangement of the controls; this bakelite panel is finished in imitation walnut so as to match the cabinet as nearly as possible.

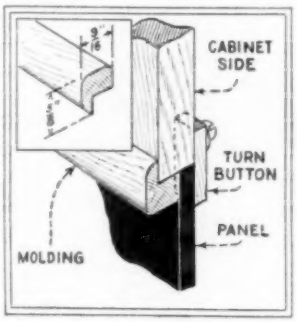
Mount the finished set on small wooden blocks and connect the A and B-batteries or powerizer for a thorough test before the instruments are finally placed in the cabinet. The detailed diagrams for making these connections are shown on this page; turn on the filament switch and place one tube of the 201-A type in each socket in the set successively to test the filament circuit. If the tube lights correctly in each socket, it is safe to proceed with the test. Then insert the tubes in the detector and first a.f. sockets and plug



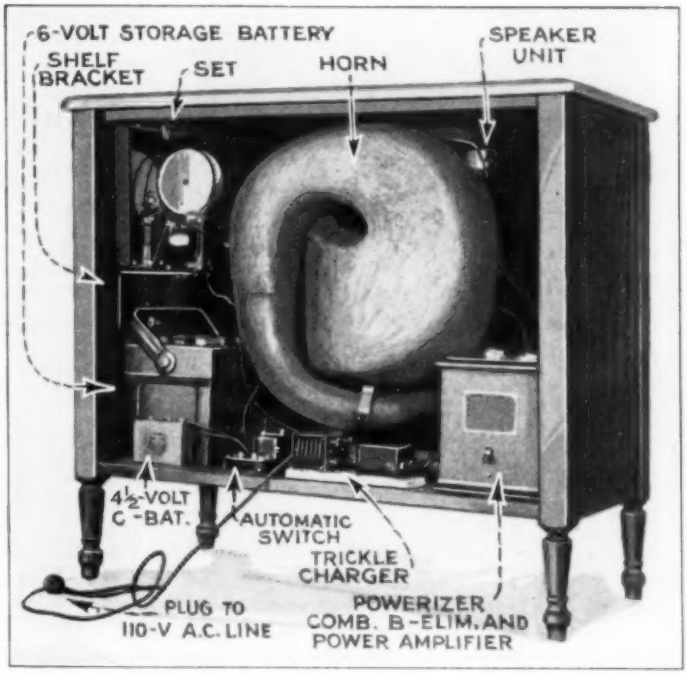
Above, Schematic Diagram of Receiver Circuit; Below, Detailed Hookup with Combination Power Amplifier and B-Eliminator, Automatic Switch and Trickle Charger, All Controlled by Filament Switch on Front Panel

the signal lead from the powerizer in the second a. f. socket, making sure the super-amplifier and rectifier tubes are in the sockets designated for them in the powerizer. If the lower hookup on page 1008 is used, plug the relay switch into the 110-volt 60-cycle house-lighting supply, and turn on the switch at the front of the powerizer. The switch on the front panel of the receiver will then alone control the entire installation.

Now, with the loop leads plugged into the small jacks at the rear of the subpanel and the center lead in the center jack, rotate the large condenser dial slowly and adjust the detector-tube rheostat. The plates of the midget condenser should be about half out for the initial test, and, as soon as a station is picked up, the large dial and the midget condenser should be adjusted for the loudest and clearest signal. Volume may then be controlled by the variable resistance as desired. For loudest signals, the edge of the loop should point directly toward the transmitting station. This directional effect of the loop is put to good use in cutting out undesired stations and similar interference. The set is very selective, separating stations in Chicago when other larger and more expensive sets fail to do so.



After you have familiarized yourself with the operation of the set, disconnect the various apparatus and prepare the cabinet for the installation. The photo of the rear of the cabinet, with the back removed showing all apparatus in position, appears on this page; the large exponential-type horn is seen at the center with the apparatus grouped about it. This photo shows everything in detail and requires little explanation. Plenty of room is available for the apparatus without crowding. The set is mounted on shelf brackets at the upper left, as viewed from the rear; the square hole in the side of the cabinet for the instrument panel must be carefully measured and cut so that the panel fits into it neatly. Walnut picture-frame molding is then mitered to fit the hole and glued and pinned in position. The detailed sectional sketch shows the method of fitting and framing the instrument panel. A small wooden turn button is screwed to the inside of the cabinet directly above the instrument panel to hold it in position and facilitate easy removal of the set. The back of the loudspeaker cabinet should be drillled with a number of holes to provide free air circulation, and the powerizer should be kept as far as possible away from the A-battery. The loop leads are held by insulated cleats along the inside of the cabinet at



View of Cabinet Speaker with Back Removed, Showing the Location of the Various Instruments

top and brought out through slots, cut in the back cover at the upper rear, to the loop placed on top of the cabinet.

The finished installation is neat, efficient, and leaves little to be desired for the music lover who insists on real tone quality and is satisfied with the local broadcast and chain-station programs in the large cities.

Large blueprints of the diagrams have been prepared and may be obtained from Popular Mechanics Radio department, 200 E. Ontario st., Chicago, Ill., for 25 cents to cover postage and packing. Specify blueprint No. 124.

MATERIAL LIST

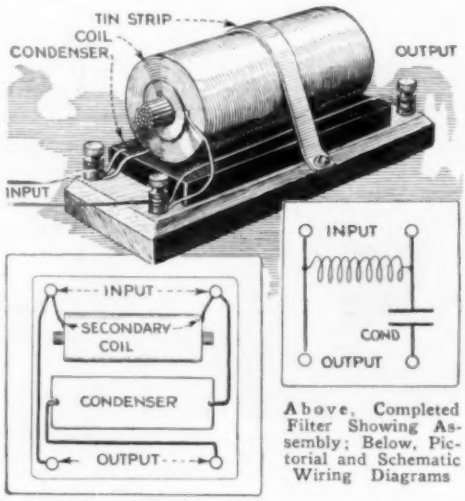
1 front panel, 3-16 by 7 by 10¼ in. (Exact size optional.)
1 subpanel, ⅛ by 7 by 12¼ in. (Exact size optional.)
1 Remler condenser No. 649, .0005 mfd.
1 Remler drum dial No. 110.
1 midget condenser, either 50 or 55 mmf. (Hammerlund or similar type.)
1 rheostat, 20-ohm, Frost, Yaxley, Electrad or similar type.
1 Electrad Tonatrol (variable resistance).
1 filament switch, Yaxley or similar type.
2 Amperites or ballasts, ¼ amp. each, complete with mountings.
3 X-type tube sockets, Benjamin or similar spring-suspended type.
1 grid condenser, .00025 mfd., with gridleak clips.
1 gridleak, 2 meg.
2 a.f. transformers, Ferranti, Amertran, Silver-Marshall, or similar heavy type.
1 Jones Cabelug.
3 midget jacks and plugs, Carter or Yaxley.
2 small angle brackets.
2 6-in. shelf brackets.
22 round-head brass machine screws, 6-32, ½ in. long.
9 round-head brass machine screws, 6-32, 1 in. long.
2 doz. soldering lugs, long round-hole type.
4 lengths of round tinned-copper busbar wire.
12 ft. rubber-covered hookup wire.
2 pieces ¾-in. walnut picture-frame molding, 22 in. long.

SUGGESTED EQUIPMENT

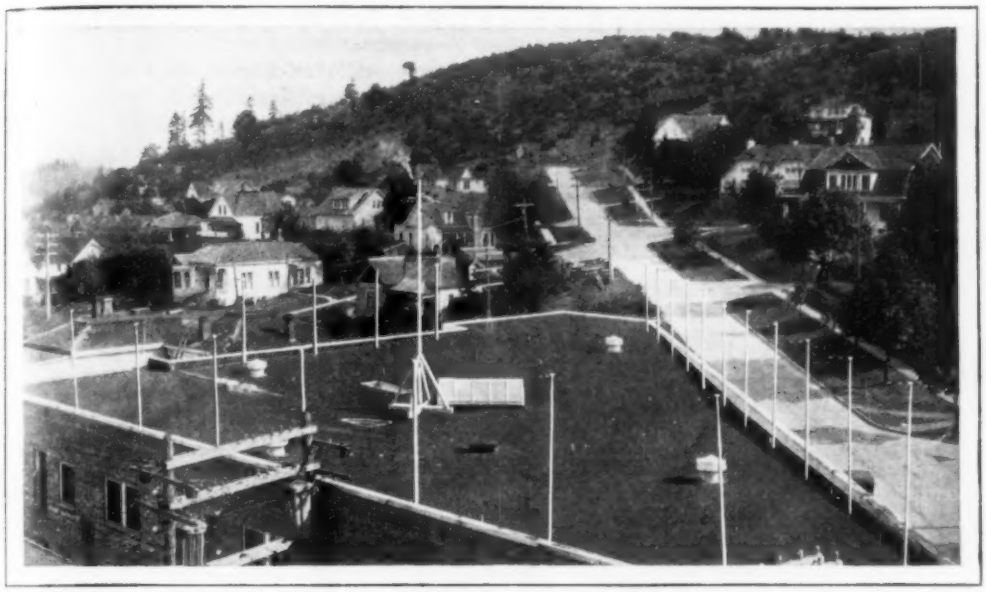
2 UX 201-A, or similar type, tubes.
1 C-battery, large size, 4½ volts.
1 6-volt storage battery, 80 or 100-amp. type.
1 Automatic relay switch, Yaxley No. 444, or similar type.
1 trickle charger, Kuprox, Balkite, or similar type.
1 Powerizer P-1, with tubes specified.
1 Newcombe-Hawley cabinet speaker No. 55.

Tone Filter Made from Ford Coil

With the new power tubes, some device is necessary to keep the high voltage out of the loud speaker, in order to prevent the speaker windings from burning out. A very efficient filter for this purpose can be made from an old Ford spark coil. This is cheap and does the same work as a more expensive filter especially designed for the purpose. The spark coil is taken apart, care being used not to break the end leads of the secondary coil. The primary, or inside, leads are not used and are cut off. The iron core is left in place. A small wood or bakelite base, about 3 by 5 in., is made, and the condenser taken from the coil box is placed on this base. The coil is then put on top of the condenser and held by a strip of brass or tin, as shown in the illustration. Holes are drilled at both ends of the base for binding posts, two on each side. The filter, now complete, is connected as shown, only three wires being required; these should be soldered to the terminals and care should be taken that the condenser is in good condition and is not punctured or blown out. The entire filter may be placed inside the receiver cabinet or outside. The input is connected to the loudspeaker terminals on the set and the speaker to the output side of the filter. The secondary, or choke coil, as it now is, permits the d.c. of the battery to reach the plate of the amplifier tube while the condenser keeps it out of the speaker, thus protecting the windings.



Above, Completed Filter Showing Assembly; Below, Pictorial and Schematic Wiring Diagrams



Washington Apartment House Has a Neat Installation for 32 Aerials, Consisting of a Large Central Mast and a Number of Small Masts

Aerials on Apartment House

Rather than have a maze of aerials crisscrossing each other and running in all directions, a neat installation of 32 aerials was devised for a Washington apartment house. It consists of one large mast erected in the center of the roof and 32 smaller ones at the edges, the aerials radiating from the central mast. The lead-in wires were, of course, attached to the aerials at the end near the short masts. This installation has the advantage of preventing the aerials from touching each other.—Carlton Groat, The Dalles, Oreg.

Trickle Charge from Full-Current Charger

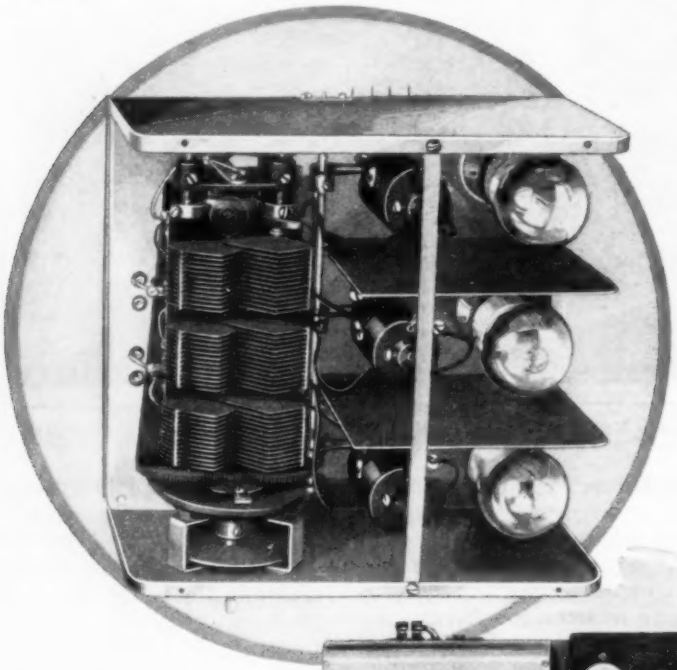
The effect of a trickle charger for radio batteries is accomplished by connecting an ordinary charger of full current rating, such as the 2-amp. type, to a circuit containing a lamp that is in definite periodic use. This lamp should be one that is normally used a little while each day, so that the battery will be charging whenever the lamp is in use; for example the cellar light, used each day during attention to the furnace and other jobs. Experience has shown that this gives the battery almost enough charge to meet ordinary needs; at least it comes near enough to doing this in the average household so that the battery requires a regular charge only at rare intervals. A little observation will enable the average set owner to select some lamp in the house that will greatly assist in keeping up the required charge. When putting this plan in operation, the charger is, of course, constantly connected to the storage battery.

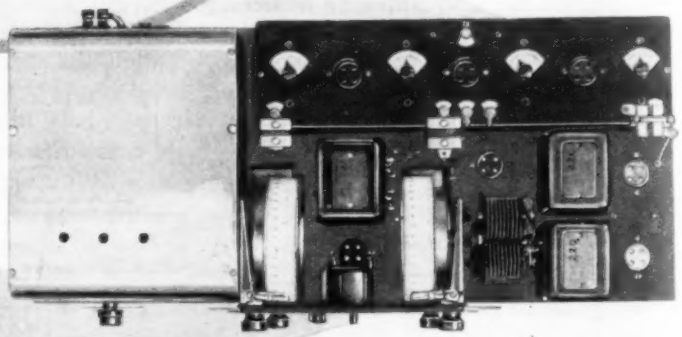
Small Electrically Driven Coil Winder

For the small manufacturer, the coil winder shown in the photo will be of considerable utility. It is driven by means of a small universal motor, which will operate either on a.c. or d.c., and from 2,000 to 3,000 coils can be made in a week by one operator. Various sizes of wire can be used, and the turns are counted automatically. The speed can be varied by means of a foot-operated rheostat. The entire machine is made of bronze with steel shafts, and is portable.

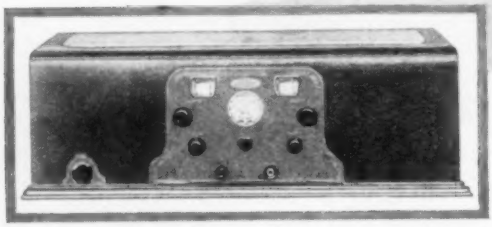
SHIELDED UNITS FEATURE NEW INFRADYNE

Efficient shielding and compact construction make the new model of the infradyne receiver, shown in the accompanying illustrations, of special interest.





Above, Radio-Frequency Amplifier and Detector Unit Removed from Copper Box; Right, Complete Assembly as Viewed from Above; Below, Installed in Metallic Cabinet Showing Compact Arrangement of Controls



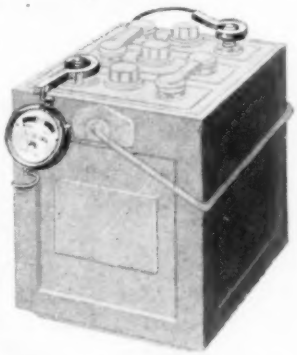
All units are supported on a pressed-steel base, heavily enameled in black and drilled to accommodate all mounting screws and wiring. The shaft from the left-hand drum dial extends into a completely inclosed copper box and the instruments are assembled in this box. The three-in-line condenser, three coils and three sockets, with each stage isolated by shielding, make up this assembly. These units, with the necessary tubes, constitute two stages of r.f. amplification and detector. The three-in-line condenser employs three small balancing condensers, by means of which capacities introduced by the wiring and tubes may be compensated for at the time the amplifier is put into service. Referring to the center photo, we find the infradyne amplifier mounted at the rear of the base; this is the same amplifier as that used during the past year and has been described in a previous issue, its ability to sharpen tuning and to build up volume without increasing background noises being well known to the home constructor. Back of the bronze panel carrying the instrument controls is a pressed-steel panel upon which are mounted the voltmeter, infradyne amplifier rheostat, two drum dials and the oscillator-tuning condenser. Behind the drum dials, and supported on the pressed-steel base, are the volume and sensitivity-control rheostats, connected respectively in the r.f. tube-filament circuit

and, in series with a blocking condenser, between the positive-B and negative-A infradyne-amplifier leads. These rheostats are operated through extension shafts from the front control panel. The tube sockets, two a.f. transformers and output transformer complete the assembly. The lower photo of the completed set in the attractive sheet-copper cabinet shows the controls grouped at the center. The cabinet is finished in two-tone brown enamel, and is mounted on a decorative wooden base. All controls, except that for an antenna compensator, are mounted on an etched bronze panel, set off in red enamel, and the control knobs are of brown molded bakelite.

Power Sets Require Full Line Voltage

While the radio fan, having a powered set, is usually correct in assuming that his line delivers 110 volts, a check with a good a.c. voltmeter will often show that the voltage is 100 volts or even less. The failure of some power units to give satisfactory results may often be traced to deficient line voltage. This is especially true in rural districts, where transmission lines are long and the voltage is not so carefully regulated as in the more thickly populated districts.

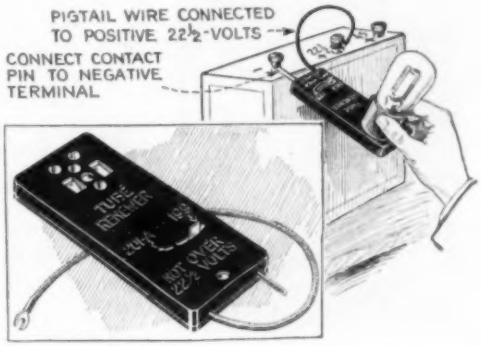
Handy Battery Tester



The handy battery tester shown in the photo is intended to be permanently connected across the storage battery terminals by means of two special clamps. When a reading is desired, a push button on the side of the voltmeter is pressed. The scale is divided into three sections, marked "Start Charging," "OK" and "Stop Charging," respectively. Battery tests are made when the set is turned off and when the charger is not in operation.

Tube Booster Works on B-Battery

A tube rejuvenator of very low cost, that will boost any type of tube on the batteries of the radio set has recently made



its appearance on the market. Tube renewal is thus made available to every owner, regardless of the type of lighting current in his district. The renewal of a 201-type tube takes less current from the batteries than the average set uses in one hour of operation, and the 199-types require a still smaller amount. This cheap and simple device adds many useful hours to the life of the tube.

Cleaning Aerial Insulators

Soot accumulation on aerial insulators should be removed at least once a year if good continuous reception is to be expected. They may be cleaned with carbon tetrachloride. Also, the connections should be tightened and resoldered if necessary. The slack in the aerial and lead-in wire should be taken up, since the weight of the wire itself and the sway due to wind pressure will gradually loosen any aerial in time. These attentions may bring back stations you have not heard for some time.

Following Specifications Important

Good results are seldom obtained by the set builder unless he follows exactly the specifications of the designer. The latter has usually tried all the possible combinations before he has approved a description for publication. Small changes in the set may seem practical, but they frequently interfere seriously with proper functioning at some other point.

Loud Speaker Built in Globe Form

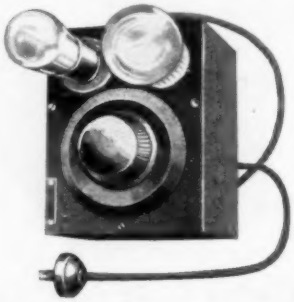
Different from the various types of loud speakers now on the market, the instrument shown in the photo is a hollow globe with the reproducing unit inside. A map of the world is printed on the outside and it is covered with a transparent finish which can readily be cleaned with a moist cloth. It is claimed that this speaker gives exceptionally good reproduction and good tone quality, besides its feature of utility.

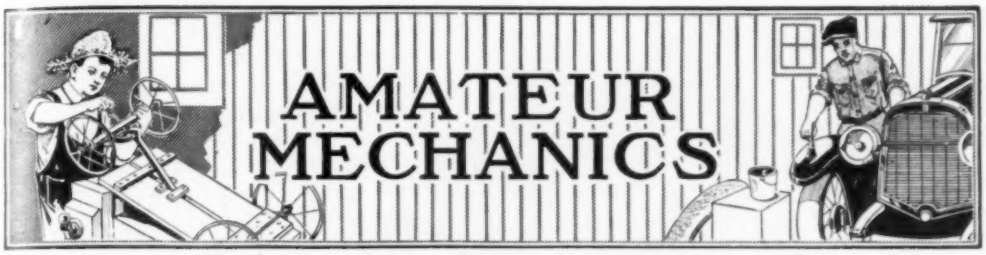
Recharging Dry B-Batteries

It has been generally assumed that it is impossible to recharge dry batteries, and in the case of dry ignition or radio A-batteries, it is. But it has been found by recent experiments that any ordinary B-battery can be recharged as easily as the storage type. This should be welcome news for the many fans to whom replacing B-batteries represents one of the chief items of maintenance expense, particularly since the advent of power tubes with their heavy drain on the B-supply. To recharge a set of dry B-batteries, simply proceed as in the case of storage batteries. Many A-chargers are equipped with a tap for charging B-batteries and this can be used with good results. If such a means is not available, one of the simple electrolytic B-chargers can be rigged up in a few minutes; or, if something permanent is desired, a charger designed especially for use with dry batteries, now on the market, can be used. Only one or two precautions are necessary. First, keep the charging rate low, to prevent the batteries from heating, which will drive off the active material and shorten their life. A current as small as from 40 to 50 milliamp. is usually satisfactory, though, if no means of measurement is at hand, it will be necessary to determine the correct rate by experiment, keeping in mind the size of the battery being recharged. Also, be sure that all batteries in a series are of the same size (capacity, not voltage). Otherwise, a charging current which would not damage a large heavy-duty battery would cause a small battery to become seriously overheated. Next, let the charging continue for some time—even several days, if the batteries are badly run down. A long-continued charge every few months will give better results than briefer charges at more frequent intervals. To check the progress of the charge it is, of course, not possible to take hydrometer readings as with storage batteries. Instead, voltmeter readings must be relied on, and these should be taken with the charging current turned off. If they are not, the voltage of the charging current, not of the battery, will be shown. It is not claimed, of course, that dry batteries can be recharged as often as those of the storage type. After several repetitions, the active material in the cells gradually becomes exhausted to the point where repeated charging is not practicable. But from four or five to as many as a dozen times it can be done, with a saving that makes the small trouble and consumption of lighting current required, well worth while.

Oscillator for Testing and Calibrating

Signals at any wavelength from 200 to 575 meters can be radiated by means of the simple oscillator shown in the accompanying photo, and these can be picked up by the average receiver at any distance not over 50 feet away. Such a device is especially useful to service men for neutralizing and calibrating receivers. It is provided with a cord and plug, so that it can be connected into a light circuit. There is no buzzer, and no batteries are required for its operation.





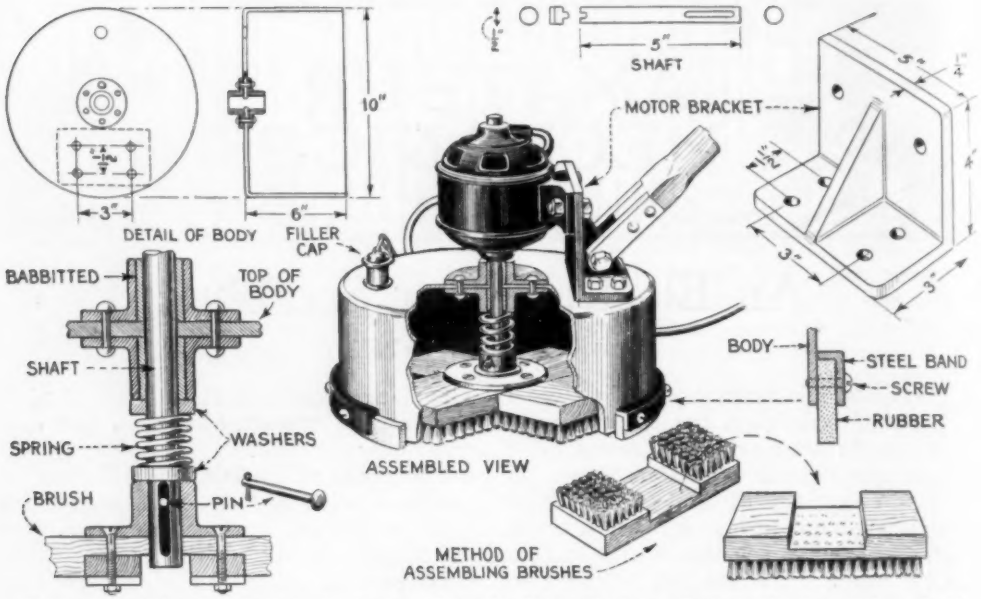
An Electric Floor Scrubber

By ARTHUR N. CAPRON

WHERE it is necessary to do quite a bit of scrubbing, the electric outfit shown in the drawing will be found to be a great convenience and labor saver. It consists essentially of a metal casing of cylindrical shape, inside of which a brush is arranged, while a motor is attached on top by means of a bracket, which also serves as a pivot support for the handle. The casing consists of a cast-iron sauce pan, about 10 in. in diameter and 6 in. high. The center is accurately scribed, a ½-in. hole drilled through it, and two 1-in. pipe flanges are then riveted or bolted to the bottom, one on each side, and centered over the hole.

The inside of the flanges is babbitted to receive a length of ½-in. steel shaft, which must be at right angles to the surface of the flange. A rubber ring, ½ in. thick, is fastened all around the edge of the casing, as shown, being held in place securely by means of a steel strip, ⅛ by ¾ in. in dimensions, which is screwed to the casing, holes being drilled and tapped to receive the screws. The rubber ring should extend ½ in. from the end of the casing and serves as a water-tight packing when it is in contact with the wetted floor, preventing the water from splashing outside of the casing. The shaft is a 5-in. length of ½-in. cold-rolled steel, which is notched at the top end for an Oldham coupling, by means of which the motor is connected. The bottom end of the shaft is slotted to

Floor Cleaning Is an Easy Task with This Electric-Driven Scrubber, Which Carries Soapsuds over the Floor and Does Not Splash

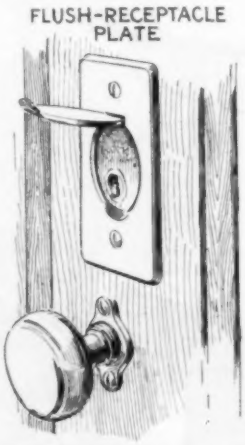


Constructional Details, Showing the Casing, Shaft, Scrubbing Brushes and Motor Bracket, and an Inside View of the Assembled Scrubber

permit attachment of the scrubbing brush. This consists of two ordinary floor brushes, assembled as indicated, and a pipe flange screwed on top securely. The inside of the pipe flange is reamed out to make a sliding fit on the shaft, and a pin is driven through both flange and shaft to hold the brush to the shaft yet permit vertical movement. A coil spring and two washers are provided on the shaft, to keep a downward pressure on the brush, forcing it against the floor. However, this spring must not be so strong that it will tend to raise the casing from the floor. A heavy angle bracket, of the shape and size shown, is provided to hold the motor in position securely and furnish a support for the handle. It is bolted or riveted to the casing, so that the motor is located centrally over the shaft. The end of the motor shaft is shaped to fit the notched upper end of the brush shaft. A filler cap is also provided, as indicated, through which a quart of hot soapsuds is poured for scrubbing. This will not leak out if the rubber facing is even and held tightly against the floor. The brush, revolving against the surface of the floor in the hot soapsuds, cleans it thoroughly. By moving the scrubber over the floor, the suds are carried along, and therefore very little of the suds is required. The brush can be removed by merely taking out the cotter pin.

Receptacle Plate Protects Door Lock

It is sometimes difficult to open locks of the pin-tumbler type if a few grains of sand have become lodged inside. This trouble is especially likely to occur in locks on summer cottages, where sand is blown about by the winds. An ordinary flush-receptacle plate of the kind shown in the drawing, obtainable at any electrical store, will be found effective in keeping dirt out of the lock. Some types of locks will permit fastening the plate directly to door while other types necessitate the use of a block of wood through which a hole is drilled to fit over the lock, and on which the plate is then screwed down.

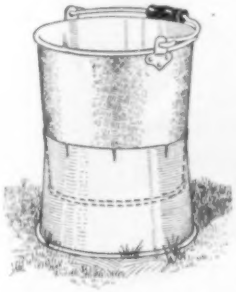


Reducing Christmas-Fire Hazard

Serious accidents caused by Christmas-tree fires could be avoided to a great extent if proper precautions were taken to render the ornamental decorations fireproof. Cotton wool, in the majority of cases, is used to give the appearance of a snow-covered floor and is also scattered over the tree. In its natural state it is a most dangerous and highly inflammable material, but with proper treatment it can be made reasonably safe for use. Make a solution of ½ lb. of alum to 2 qt. water, or any quantity of the same proportions. Hot water must be used to dissolve the alum; when the solution has cooled, soak the cotton wool in it and hang it up to dry thoroughly. When it is quite dry it must be pulled apart to renew its original appearance. The solution can be used for other decorations constructed of light materials. Tissue-paper ornaments can be made practically fireproof by a solution of 10 parts of ammonium sulphate, 4 parts of boracic acid, and approximately 3 parts of common borax, with 100 parts of water. Dip the paper in the solution and carefully dry it, to retain its original shape.

Clean Milk-Pail Bottom

To clean milk pails and utensils well is the endeavor of every good dairymaid, but when the milking is done in the feed lot or in the pasture, the bottom of the pail often becomes so soiled that the washing is a very disagreeable task. One farmer, however, eliminated this trouble by cutting the bottom half off a discarded feed pail and using the upper portion in an inverted position to hold the milk pail. The latter is gently forced into this holder and the two cling together so that they can be carried about without further attention. After the milking is finished and the pail is emptied, a slight blow against the side of the holder dislodges it.—G. E. Hendrickson, Argyle, Wis.



Keg, Ornamented with Pebbles and Seashells, Makes an Artistic Dovecote

Ornamental Dovecote

A highly artistic and attractive dovecote may be seen in the park grounds of the municipal zoo at Surabaya, Java, in the Dutch East Indies. It is beautiful in spite of the fact that it is constructed from the cheapest kind of materials, and its cost was practically nothing except the labor of the zoo keeper, who built it during his spare time. It consists of an old barrel having holes cut in it to permit the entrance of the birds, a wooden roof, a shelf and a pedestal. It is coated with cement and covered with pebbles and seashells. It would be a very simple matter to modify this form of construction for native wild birds in this country, swallows, wrens, bluebirds, martins and others, and it would make a good squirrel house for parks or private estates. Such a bird house is attractive and weather-resisting.

Canopy for Rumble Seat in Car

A person riding in the rumble seat of a roadster has no protection against the weather, unless a portable canvas canopy

Homemade Canopy over Rumble Seat of Roadster Protects Occupant from Weather

of the kind shown in the photo is provided. This is a homemade affair and consists of a set of pipe and fittings, which is fastened to the car securely, the canopy being attached to it.

Windshield Warmer

A length of flexible metal tubing, led from the heater to the portion of the windshield just ahead of the steering wheel, will deflect the heat entering the car so that ice on the outside of the windshield will melt, and, with the aid of the automatic wiper, the glass in front of the driver can be kept clear, even during sleet and freezing rain. The tube can be permanently installed, as the deflection of the warm air does not make any appreciable difference in warming the car.

Automatic Valve Fills Water Pan

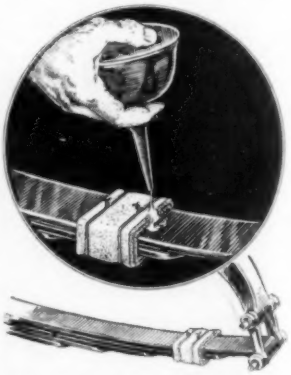
Most hot-air furnaces are equipped with a water pan for adding moisture to the dry, hot air. Usually it is necessary to refill this box every day as the water evaporates quite rapidly. To eliminate the trouble of doing this, one home owner installed an ordinary float valve on the pan; as soon as the water drops to a certain level the valve opens, and the pan is filled automatically. The float is attached to the valve on a rigid arm and closes the valve when the pan is nearly filled.—C. E. Weibezahl, Syracuse, N. Y.

Corks in Mucilage Bottles

Ordinary corks, in glue or mucilage bottles, stick badly after being removed a few times, so that the user does not put the cork in securely, with the result that the mucilage soon dries out. The trouble can be avoided by dipping the cork in fresh paraffin or tallow before replacing it in the bottle. If neither of the above substances can be obtained, rub the cork with vaseline, which will have the same effect but is more easily rubbed off than paraffin or tallow, and is also objectionable because it is greasy. This kink will save many a bottle of mucilage.

Oiling the Auto Springs

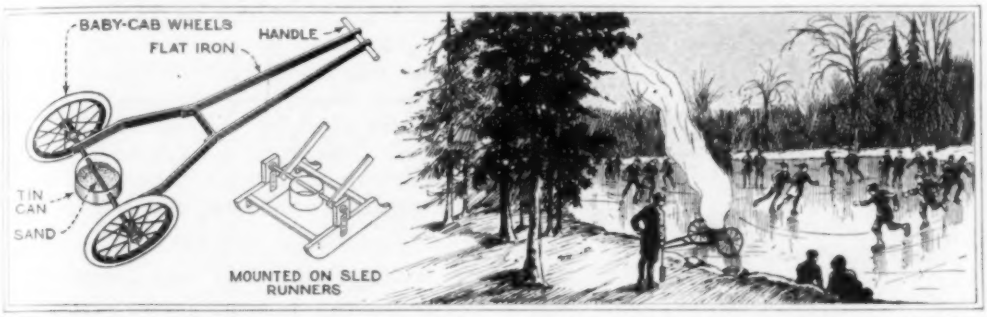
When the oiling of the auto springs is neglected, squeaks and chirps soon develop, and the riding qualities of the car suffer. Overoiling, on the other hand, brings conditions that are just as bad, and, in any event, the job of oiling the springs is an awkward one. The simple device shown in the illustration not only makes the task an easy one, but it feeds oil to the springs in just the right amount to make them ride easily and to keep down the squeaks. It consists of a few turns of felt wound around the spring, near the end, as indicated, and fastened in place with wire ties. The felt is soaked with oil once every two weeks or oftener, depending on the use of the car and the weather conditions.



¶ A little fresh developer added occasionally to old developing solutions will bring them up in speed and intensity.

Flaming Beacon for Night Skaters

This beacon will be found useful for skating or coasting parties, as it is easily moved about and will give light for a long time. When set on top of the coasting hill, it will cast its beams for miles. It consists of two wheels with a metal can mounted midway on the axle that supports them. The handle is fashioned from two lengths of flat iron with a rod or broom handle set through holes in the front end. If desired, only one length of flat iron of double length, bent sharply in the middle, can be used. Besides the rod, two wheels, such as can be salvaged from an old baby cab, are needed, together with the axle. Holes are punched through the side of the can just above the middle and the axle is run through them. After drilling the ends of the lengths of iron, fit them over the axle, drill the front end and insert the handle. If the holes at the rear end are a tight fit, the "pinch" on the handle at that point will hold it in place securely. Before starting out, fill the can with dry sand and pour over it some kerosene to which a small amount of gasoline has been added. When it is lighted, the beacon will burn for several hours. When facing the wind, draw the light behind you and, if the wind comes from behind, push the light in front of you. If desired, runners can be used instead of wheels. These can be made of light material, 1½ in. thick, 4 or 5 in. wide and about 14 in. long. Drill holes for the ends of the axle 1 in. from the top and 2 in. ahead of the center, and the runners will ride rough spots with ease.—Dale R. Van Horn, Walton, Nebr.



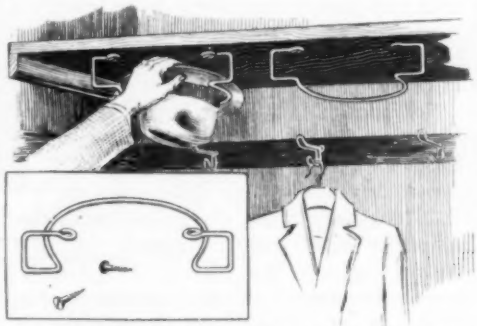
You Can Have Much More Enjoyment from Skating or Coasting at Night, If You Provide Yourself with a Flaming Beacon to Give Light

Restoring Tone Quality of Violin

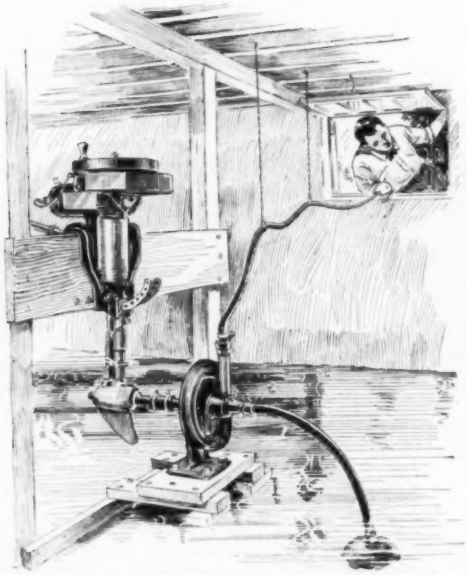
A novel method of quickly restoring the tone quality of a violin, which has become sluggish and impaired in this respect, due to long periods of disuse, consists in placing the instrument with its sound holes in close proximity to a radio loud speaker. It has been found that new violins can be "aged" in the same way.—Luke Mattera, Brooklyn, N. Y.

Hat Hangers for the Closet Shelf

In closets where the space is limited a simple device can be used to keep hats in place and entirely out of the way. It is made of No. 10 galvanized-iron wire, which is bent to the shape shown in the drawing, two "eyes" being provided at the ends, as indicated. The hanger is then fastened to the underside of a shelf with two wood screws through the eyes. A number of these hangers can be used in most closets.



Easily Made Wire Hat Hangers Attached to the Underside of a Closet Shelf



Outboard Motor Connected to a Small Rotary Pump Removes Water from Flooded Basement

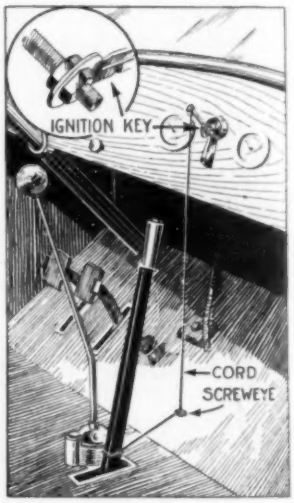
Outboard Motor Removes Water from Flooded Basement

Owing to the breakage of a water main, a resident of an eastern town found his basement flooded to a depth of nearly 2 ft., with no means of draining it after the main was repaired. He solved the problem by using his outboard motor and a small centrifugal pump borrowed from a near-by supply house. A heavy plank was spiked across the basement a short distance above the water level, and the motor was clamped to it solidly and in a vertical position. The propeller was removed from the driving shaft and the latter was fitted to a piece of pipe, about 1 ft. long, in which holes were drilled and tapped for two setscrews. The pulley was removed from the pump shaft and the pump was bolted to a heavy piece of timber, which was blocked up from the cellar floor until the pump shaft came in exact line with the propeller shaft on the motor. The two were then clamped together with a pipe coupling. The blocking and the motor were thoroughly braced in all directions so that they could not work out of line by vibration. The intake hose was fitted with a bilge strainer which the houseowner had on hand, although any other strainer could be used for this purpose. The motor was started, and, when thoroughly warmed up, its speed was reduced to 300 r.p.m. so that the pump would work efficiently. The water intake of the motor was piped to the bottom of the cellar by means of a rubber hose so that the motor would be kept cool at all times. The discharge hose was led overhead by tying it to the beams with cord, and the water was discharged through a window where it flowed down a grade. The open window also carried off the gasoline fumes. This outfit did the work in a few days, with only three "rests" for slight adjustments of the engine.

Holes Punched in New Overshoes

When you buy a pair of galoshes or overshoes at a price lower than usual, and you find a hole punched in the back at the upper part, the article has some defect. By this method manufacturers of rubber goods, who make galoshes and other rubber footwear, inform their customers of the quality of the product. All such goods containing minor defects in manufacture are designated as "seconds" by the hole.—J. S. Hagans, Chicago, Ill.

Instructing Beginners to Operate Autos



For use in instructing beginners to operate automobiles, the following idea is of much assistance and enables the instructor to acquire control of the car quickly and completely, as, for example, when the pupil becomes confused and steps on the accelerator instead of the brake, as often happens. The drawing is self-explanatory, the ignition being automatically shut off, releasing unnecessary strain on the drive system and brakes, as soon as the emergency brake lever is pulled back.

Photo © Edw. Levick

OF all the clippers built by that master shipbuilder, Donald McKay, the "Flying Cloud" was considered the most notable. According to Samuel E. Morrison, author of "The Maritime History of Massachusetts," McKay "built faster clippers and larger clippers; but for perfection and beauty of design, weatherliness and consistent speed under every condition, neither he nor anyone else surpassed the 'Flying Cloud.' She was the fastest vessel on long voyages that ever sailed under the American flag." Her very name breathes the spirit of the golden age of sail, and her fame endures even in this age of steam and oil.

Built for McKay's friend, Enoch Train, she was sold on the stocks to Grinnell, Minturn & Co. of New York, a sale that Train regretted for the rest of his life. Her dimensions were 229 ft. length on deck, 40 ft. 8 in. breadth and 21 ft. 6 in. depth; registered tonnage 1,783. Her commander was Capt. Josiah Perkins Cressy (pronounced Creecy), of Marblehead, Mass.

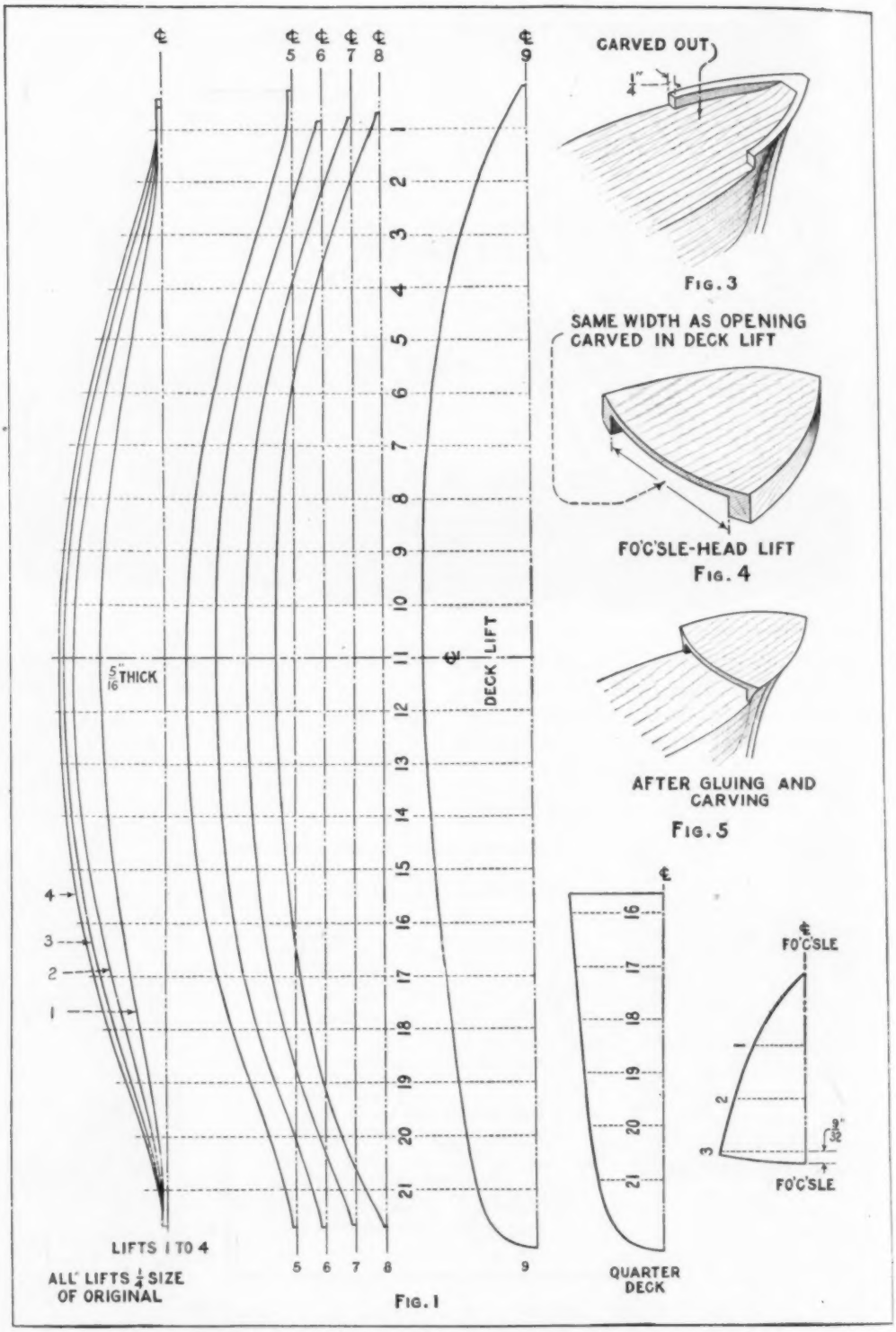
On June 3, 1851, the "Flying Cloud" slipped out past the Hook on her maiden voyage. Before it ended, she had established a new record for the voyage to San Francisco, eighty-nine days, and this was only twice equaled; once by herself in 1854, and once by the "Andrew Jackson" in 1860. On this voyage she made a day's run of 374 miles, and logged 1,256 miles in four consecutive days.

SHIP-MODEL PRIZES

FEW hobbies enable the amateur to produce such beautiful work with so few tools and such inexpensive material as ship-model building. To encourage such a worth-while and pleasant pastime, Popular Mechanics Magazine offers the following awards for the best models of the "Flying Cloud" made from plans published in this and subsequent issues:

First, $100 cash and gold medal.
Second, $50 cash and silver medal.
Third, $25 cash and bronze medal.
Five awards, $10 cash and bronze medal.
Five awards, $5 cash and bronze medal.
Bronze medals also will be awarded for excellence in workmanship.

The contest is open to everyone, regardless of age or sex. The conditions are very simple, and full details will be supplied to every reader addressing the Editor, Amateur Mechanics department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago.



Quarter-Size Drawings for Making Hull, Deck, Quarterdeck and Fo'c'sle Templates

No other clipper, except, perhaps, the famous English "Cutty Sark," makes such an appeal to the imagination, and this was

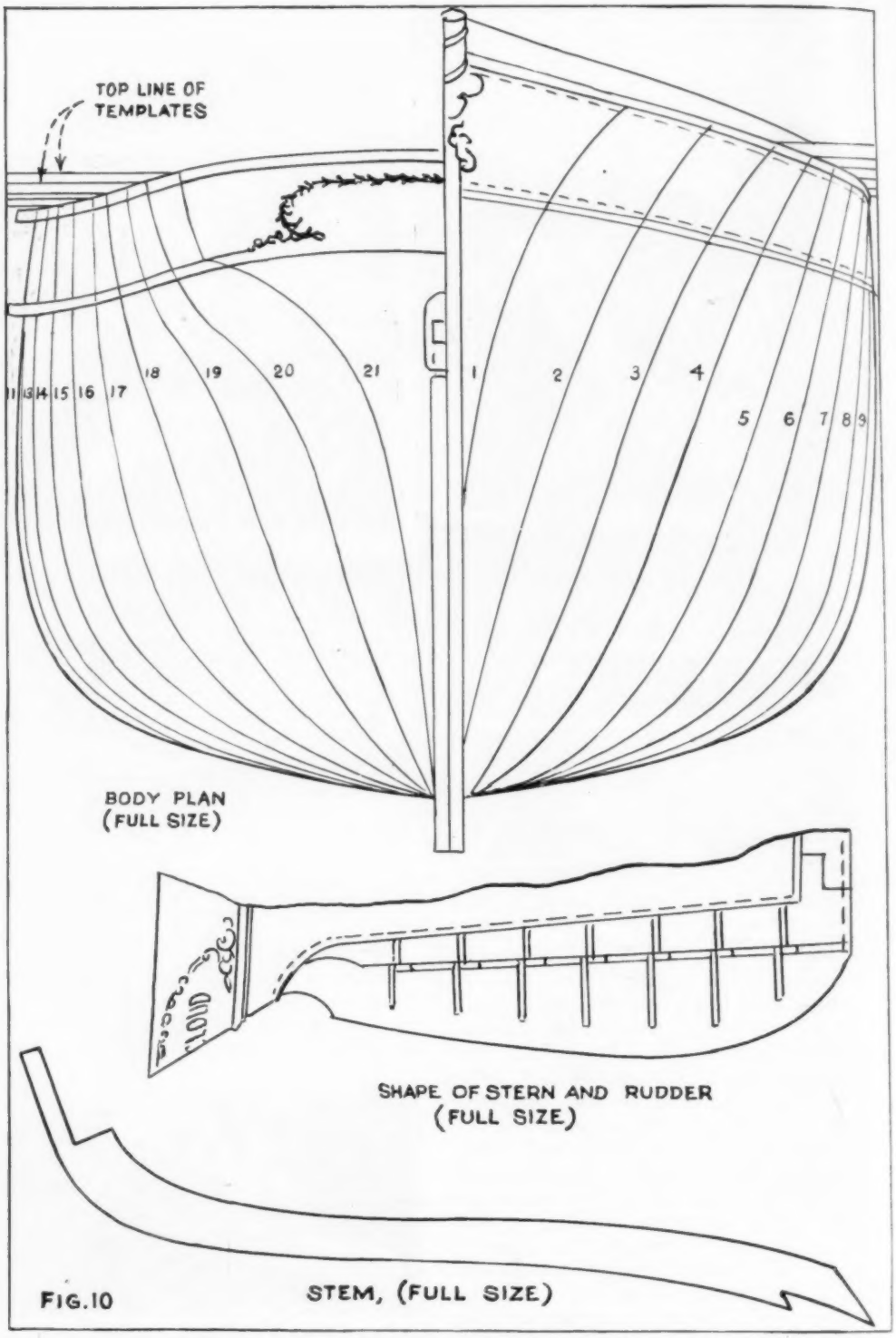
Fig. 6, Assembly of Lifts; Fig. 7, Glued-Up Hull; Fig. 8, Carving Corners off Hull with Chisel; Fig 9, Testing Hull Contour with Body Mold

the reason "Flying Cloud" was selected as the subject of our model.

While there is a great deal more detail in a model of a clipper than in our previous model of Hudson's "Half Moon," the construction is not a bit more difficult. Owing to the character of the ship, the detail in the deck fittings, etc., is finer, and the smaller parts must be made with more care; this, however, does not demand more skill, but merely a little more patience. The method of building up and carving the hull is exactly the same as with the "Half Moon," with the exception that, as the lines are finer, body molds or templates are employed to insure that they will be correct.

Arrangements have been made with a well-known firm of ship-model supply makers to furnish a complete set of parts for building the model, in order to save the reader time and trouble in assembling

Marking Off One of the Lifts from the Wrapping-Paper Template



Full-Size Drawings for Making Body Molds, Stem and Stern Templates

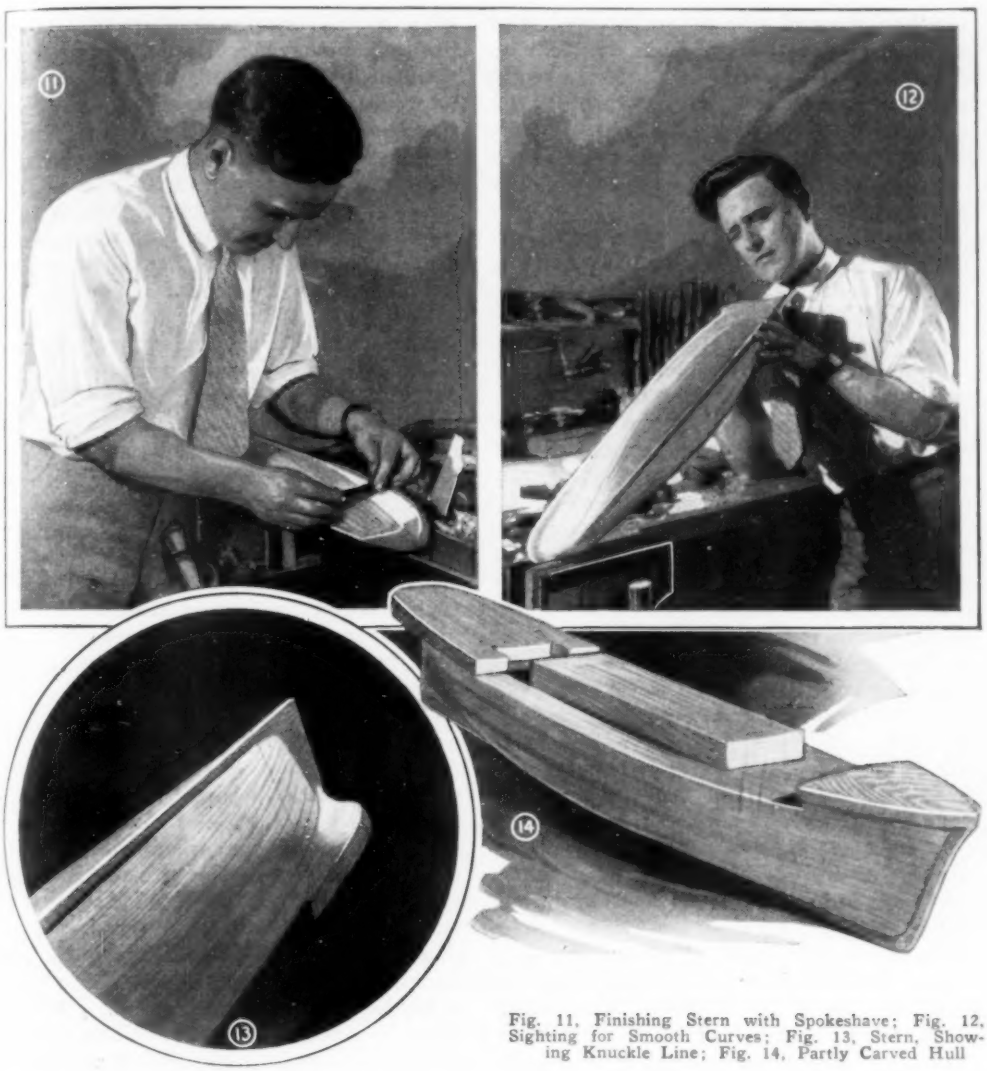


Fig. 11, Finishing Stern with Spokeshave; Fig. 12, Sighting for Smooth Curves; Fig. 13, Stern, Showing Knuckle Line; Fig. 14, Partly Carved Hull

them. These will include lifts cut to shape, wood for bulwarks, deck fittings, etc., rough blocks and deadeyes, anchors, bitts, capstans, etc. Full information about these sets will be furnished on request.

The first step in making the model is to lay out the templates for the lifts, or planks, that are glued together in "bread-and-butter" fashion to form the rough hull. Get some sheets of stout brown wrapping paper, 30 in. long, and cut it into strips, 8 in. wide. Draw a line down the center of each strip and erect perpendiculars to this line all along its length, 1¼ in. apart. Number these from 1 to 21, as in Fig. 1. The drawings for the lifts given therein are exactly one-fourth the size of the original, so, taking lift No. 8 as an example, measure with a pair of dividers the distance from the center line to the curved line representing the outer edge of the lift, along line No. 1, and step this distance off four times along line No. 1 on the wrapping paper. Do the same with lines Nos. 2, 3, and so on, until you have a series of points on the paper through which a smooth curve can be drawn, and which will look exactly the same as lift No. 8 in Fig. 1, but four times the size. Use a French curve in drawing

the line through the points marked, and make the curve "easy" from end to end. Now fold the wrapping paper exactly along the center line and cut through the doubled paper along the curved line. When cut and opened, you will have a template for lift No. 8 on which both sides will be exactly alike. Lay out the remaining templates in the same manner. Templates 1 to 4 are shown with a common center line, to save space, and 5 to 9 are separated, to avoid confusion in measuring. Mark the exact position of line No. 11 on all templates, squaring a line right across the paper. The templates will be found to fold easily along the center line if the rounded point of a pair of scissors is drawn along the line before the paper is removed from the board for cutting.

The lines given are for lifts 5/16 in. thick. There are eight of these, and one deck lift 1 3/16 in. thick. It is practically as satisfactory to make the lower lifts 5/8 in. thick, and to cut only four of them, and, if this is done, templates need only be made for lifts Nos. 2, 4, 6 and 8. In some cases it may be easier to get lumber planed to 5/16-in. thickness and in others 5/8-in. lumber, so lines for both thicknesses are given here. Make templates for the quarterdeck and fo'c'sle (forecastle) in the same way as for the others. Mark all templates for bow and stern; in Fig. 1 the bow ends of all lifts are at the top of the page.

In order to simplify the construction, blueprints have been prepared giving the lines full size. These may be obtained, at 50 cents for the set of three, from the Amateur Mechanics department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago.

The lumber used for the hull lifts is white pine, or sugar pine, 5/16 or 5/8 in. thick, well seasoned and free from knots. Eight pieces of the 5/16-in. size or four of the 5/8-in., will be required, 27 in. long, and one piece, 1 3/16 in. thick and 29 in. long, for the deck lift. Also a short piece of 1/2-in. pine, 9 in. long, for the quarterdeck, and one piece 1/2 by 4 by 5 in., for the fo'c'sle head. All pieces, except the last, are 6 in. wide. It is difficult to give an exact material list for a job of this kind, since so many of the smaller fittings are made from scraps. For example, the keel, stem, sternpost and rudder in the original model were ripped from a scrap piece of birch chair rail, and the bulwarks were cut out of the scrap left over from the deck lift.

The templates having been made, take No. 1, or No. 2, as the case may be, and pin it down on one of the boards, stretching it so that it lies flat, then run a pencil around the edge as in Fig. 2, to lay out the curves on the board. Transfer the center lines to the board also. Do the same with all lifts, then cut them out with a compass saw, fretsaw or frame saw, as convenient, cutting just outside the line. After sawing, clamp the lifts in the vise individually, and trim them down to the line with a spokeshave. Mark the bow and stern on all pieces, so that they do not become reversed when gluing; also mark the center line down the middle and at each end and line No. 11 square across each piece at the proper place. Line No. 11 is after this called station No. 11. All lines at right angles to the center of the lifts are stations. Cut a notch, 7/8 in. deep, 2 1/8 in. wide, out of the center of the forward edge of the quarterdeck, as in Fig. 16.

Lay lift No. 8 down on the bench with the center marks uppermost, coat this side, and the plain side of No. 7, with glue, set No. 7 on the lower one, lining it up in position by means of the center marks and with station 11 on No. 7 exactly over station 11 on No. 8. (See Fig. 6.) Drive in a couple of short brads to keep the lifts from shifting, and glue and set all the other lifts in the same fashion. You will have to work fast here. When the assembly is complete, clamp it firmly, so as to force all the lifts into good contact, and set aside for 24 hours to set. If desired, before gluing, the lifts can all be assembled and drilled for two 1/2-in. dowels, as indicated in Fig. 6. This makes it easier to assemble the lifts when gluing, but the dowels must be a trifle shorter than the combined height of the lifts, or they may interfere with the clamping. If large enough clamps are not at hand to take in all the lifts at once, the hull may be glued up in two or more sections. Now lay the deck lift flat on a board or on the bench, mark the position of each station on the edges, and with a pair of dividers, and measuring from the bottom edge of

the lift, lay off the sheer line from the measurements given in Fig. 15. The positive sign behind some of the figures indicates that the distance is "just a hair" more than the measurement given, and the negative sign behind others that the distance is a trifle (not quite 1/64 in.) less. In other words, one measurement is "full"; the other "scant." Lay off all these points, on both sides, from station 4 clear back to the stern, then draw the sheer line on both sides, through these points, continuing the curve forward from station 4 for a distance of 7/8 in.; at this point draw a vertical line from the sheer line to the upper edge of the lift, on each side, and connect the two by a pencil line drawn square across the lift. This represents the after edge of the fo'c'sle. A saw cut is made down this line to meet the sheer line, then the remainder of the lift is cut away, with chisel and drawknife, down to the sheer line. Leave the deck "crowned," or 1/8 in. higher along the center line than at the edges. Square and smooth the after end of the lift and glue on the quarterdeck, 1/2 in. in thickness. To make a good joint between the two, lay a sheet of sandpaper, abrasive side up, over the after end of the deck, place the quarterdeck over the sandpaper, and move it back and forth over the abrasive until the underside of the quarterdeck fits the deck perfectly. See that the station marks on the quarterdeck line up with the corresponding lines on the deck lift when gluing, as indicated in Fig. 15, above.

Mark, as in Fig. 3, a line 1/4 in. inside the edge of the fo'c'sle, on the forward end of the deck, and carve out between the marks as shown. Clamp the fo'c'sle lift in place temporarily on the deck lift, placing it according to the station lines, and mark the curve of the fo'c'sle deck from the dimensions given at stations 1, 2 and 3 in Fig. 15. Cut the deck down to this line, then carve out the underside to the same size as the opening carved in the deck, leaving the fo'c'sle deck 1/8 in. thick, and glue the fo'c'sle head in place. When the glue has set, glue the deck lift to the remainder of the assembly. Crown quarterdeck and fo'c'sle deck 1/8 in., like the main deck.

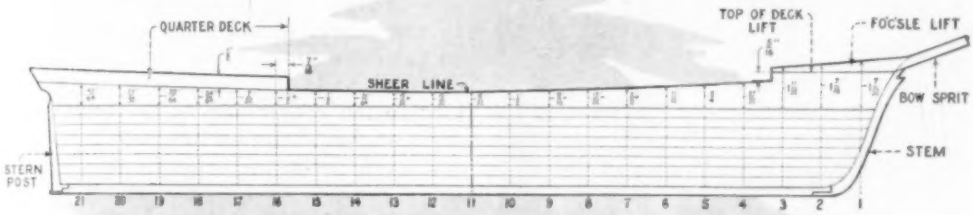


Fig. 15

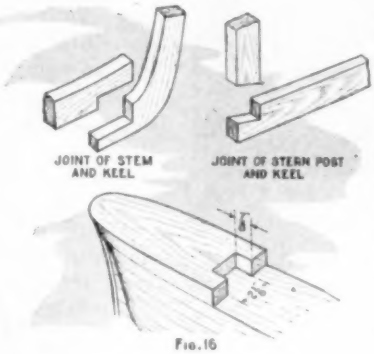


Fig. 16

Now make up a set of body templates or molds from the body plan, Fig. 10. The lines in this plan represent what each section of the hull would look like if it were sliced like a loaf of bread at each station line. The lines on the left represent sections of the hull as viewed from the stern; those on the right, sections as sliced and viewed from the bow. Trace each line separately on a piece of stout bristol board, or heavy cardboard, then cut out carefully along the curve, and leave enough of the cardboard to enable it to be handled easily, as shown in the photo, Fig. 9. Taking mold 1 as example, it is cut along the curved line, straight down the stem, down to the bottom of the keel, then across to the center of the keel, and cut off at this point. Note the molds in the photo, Fig. 7. Number the molds as they are drawn and cut. Make a stem template from the full-size drawing in Fig. 10, also a template for the shape of the stern, inside

the sternpost, and one for the sternpost. Cut a temporary stem and sternpost out of 3/16-in. wood, and carve and file the stern and bow of the model until the stem

"Crowning" the Surface of the Fo'c'sle Deck; Note Improvised Cradle Holding Hull

and sternpost fit correctly, then cut a temporary keel from 3/16 by 1/4-in. wood and tack all in place. These pieces help a lot in carving the hull, and the reason for using temporary ones is that, in carving near the ends, it is almost impossible to avoid digging slightly into the stem and sternpost, so that if permanent pieces were fitted they would be badly marred. Mark the station points on the keel and stem, where station 1 runs through the latter, then fasten a block to the deck by means of a couple of screws, so that the hull can be held in the vise while carving, and you are ready for the next operation. When drilling the screw holes in the holding block, place these so that one screw will come 5 1/4 in. from the forward edge of the quarterdeck and the other the same distance aft of the edge of the fo'c'sle head, on the center line of the deck. In this position, the screw holes in the deck will afterward be covered by deck erections, so they will not have to be filled.

Now, starting at station 11, begin carving the hull down to the outline given by mold 11. The corners of the lifts can be carved off with the chisel, but when the contour of the hull begins to approach that of the mold, it is well to supplement the chisel with a small spokeshave, set to take a very fine shaving. Always work one or two molds ahead of the station you are finishing; that is, when working on station 11, and carving toward the bow, carve stations 10 and 9 roughly to shape also. This helps to indicate the sweep of the curves in the hull. Also, be sure to keep the mold, when trying it against the hull, as in Fig. 9, exactly at right angles to the center line of the hull, not at right angles to the hull surface. Proceeding from the center station to the ends, carve each station point until the mold for that particular station fits exactly, and the curves of the hull, when viewed from any angle, as in Fig. 12, are "sweet" and true, showing no humps or hollows. Be particularly careful when carving at stem and stern. The bow on this ship has a pronounced flare or outward curve, and if the carver is not careful at this point, there is a tendency to destroy the true shape of the fo'c'sle deck. Also, at the stern, you will notice that mold 21 flares outward from the keel until it meets a molding; from there it runs up in an almost straight line to the deck. The line where the curve changes is called the "knuckle," and the way it looks when carved is shown in Fig. 13. From this knuckle to the deck, from a point about midway between stations 20 and 21 on one side, right around to the same point on the other side, this part of the hull is practically straight in the vertical plane, although the angle of the straight part changes rapidly as it approaches the stern, when it becomes as shown in the stern template, Fig. 10. The knuckle shows as a decided line all around the stern, following the line of the deck, and about 11/16 in. below it. "Fair up" all the curves in the hull with spokeshave and sandpaper, until they are sweet and sweeping when viewed from any angle. A mold is not shown for station 12, to avoid confusion in the drawing, but the change of section from 11 to 13 is slight, and the hull is easily carved by eye at this point.

Now drill a 5/16-in. hole in the bow for the bowsprit, at the angle indicated by

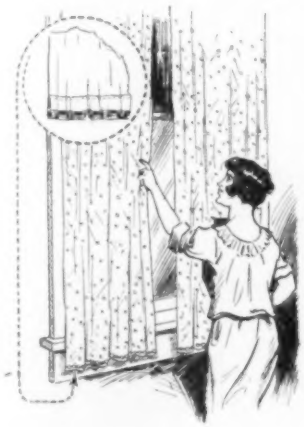
the top of the stem; drill this about 2 in. deep. Make a permanent stem, keel and sternpost from 3/16-in. birch or similar hardwood, glue and pin these in place and sandpaper them, but do not take too much off the sharp edges. Leave the rudder until later.

(To be continued)

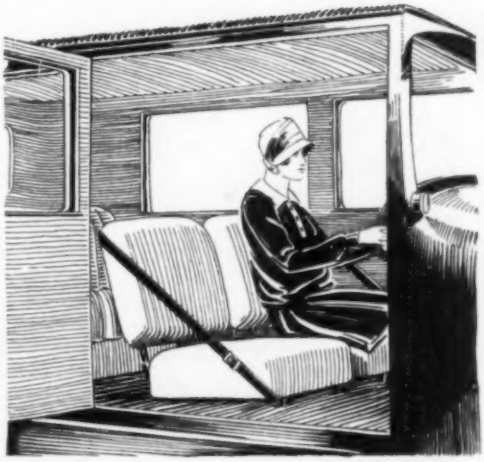
Bathing Diamonds to Check Yellow Tinge

A diamond expert claims to have discovered a method of checking the discoloration of diamonds during storage, the cost of the treatment being less than 5 cents per hundred stones. They are immersed in any solution of a blue tint, which is the complementary color of the natural yellow tinge of a diamond. The result of this immersion is that a thin film of blue coloring matter adheres to the stone and quenches the yellow light, making the gem look as if it were of the first water. When the gem is required for sale, all that is necessary to bring back the native color is to wash the stone in clean cold water and then dry it carefully. Diamonds that are slightly discolored after being worn for some time can also be improved by this treatment.

Weights for Window Curtains



A strong breeze through an open window frequently causes damage to expensive curtains by whipping them about on the sills until they become badly soiled and perhaps frayed. One housewife has eliminated this trouble by providing weights to hold the curtains down. A small chain, sewn into the lower hem, allows the curtains to drape as usual but is heavy enough to prevent whipping about in a stiff wind.



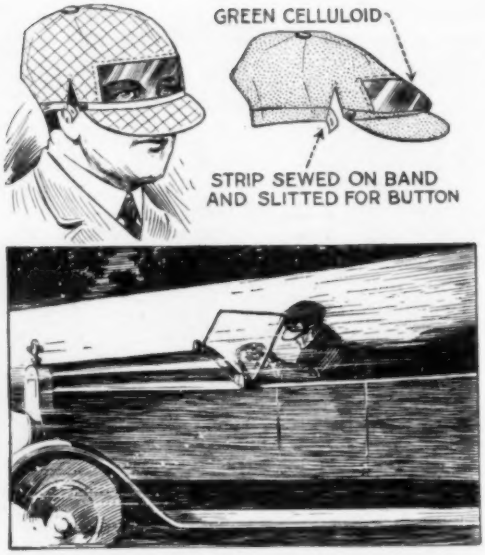
Strap Attached to Coach Seat Prevents Occupant from Falling Out, if Door Is Opened Suddenly

Leather Strap Adds Safety Feature to Coach-Type Auto

Leather straps placed on the front seat of a coach-type closed car are an advantage in holding the occupant in the seat if the door is suddenly opened. The drawing shows how the strap is arranged. If it is fitted with a buckle, it is possible to tilt the seat back for the most convenient position of the occupant. The strap should be of strong leather, and the ends held with washers and screws.

Lid for Electric Toaster Stove

Electric toaster stoves of the kind shown in the photo have many kitchen uses, but the heat cannot easily be controlled. It is often necessary to keep the contents of a pan simmering and for these occasions I keep a large tea-can lid handy. Placing this on the stove and the pan on the top of it, I find that it acts much like a stove lid over an open fire, giving just the right heat for a slow simmer. —Nellie May Moore, Hamilton, Can.



Piece of Green Celluloid in Cap Makes Good Anti-Glare Shield for the Motorist

Anti-Glare Cap for Motorists

Instead of having a separate pair of goggles to wear as a glare protector at night, the motorist will welcome the idea shown in the illustration, where the goggles are incorporated in the cap and, therefore, always at hand. Cut out a piece of the cap just above the visor and replace this with a piece of green celluloid. Of course, the cap must be large enough to permit this. The band of the cap is cut and a button and buttonhole are provided, as indicated. When the goggles are needed, simply loosen the button and pull the cap over the eyes so that you can see through the celluloid.—William C. Thomas, Chicago, Ill.

Protecting Young Trees

During the fall and winter months, it is necessary to put protectors around young fruit trees. A very good protection can be made at almost no cost and with very little work, by getting a large Russian thistle, and placing it around the base of the young tree. With the use of a little twine the thistle will prove to be a superior all-purpose protection. It will keep the rabbits away and the body of the tree shaded, thus preventing the continual thawing and freezing which kills so many young fruit trees throughout the central west every winter. If the Russian thistle does not grow wild in your section of the country, as it does in the west, you will find that it is very profitable to raise a few of them in your yard. They are real life-savers for young trees. Another advantage gained by using this protector is that, if it is not taken off from the tree in the spring, it makes an excellent mulch and prevents the ground from baking around the roots.

Kink for Fishermen

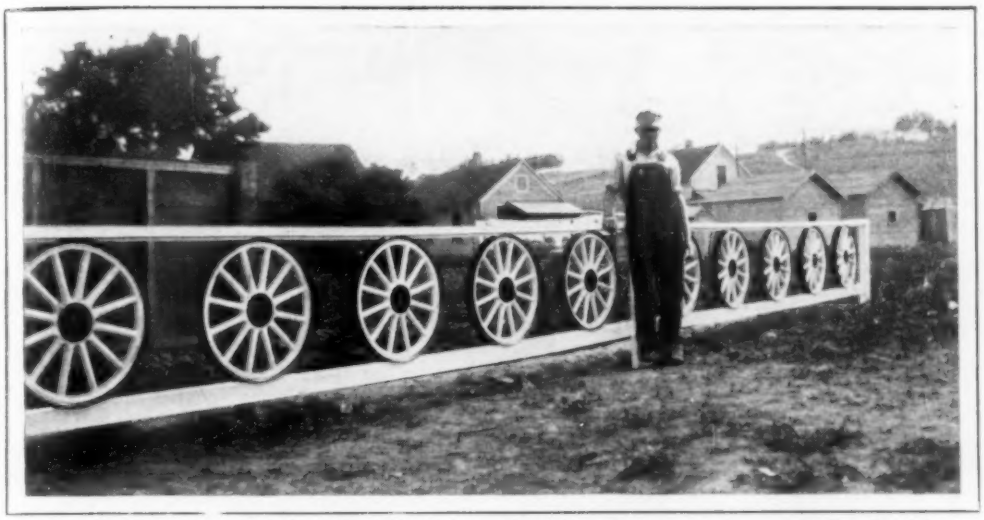
Game fish usually bite best when the surface of the water is somewhat rough. However, under such conditions the anchor often drags. This is due, not so much to the direct force of the wind, as to the pitching or "bobbing" of the bow of the boat, giving intermittent but powerful jerks to the anchor rope and shifting the anchor along the bottom. This trouble can be prevented by connecting a 3 or 4-ft. strip of rubber, cut from an old inner tube, between the boat and the end of the anchor rope.

Cleaning Out Toothpaste Tubes

Everything from toothpaste to stove polish seems to be handily put up in tubes. Quite often it is necessary to get all we can of the contents of a tube when we run short. To do this effectively, stick the end of the tube between the legs of a clothespin and turn it. The fingers can tightly

Using a Clothespin to Squeeze Out the Contents of a Toothpaste or Other Tube

press and follow the tube as it winds up. When you get to the end, the contents of the tube will be entirely removed.



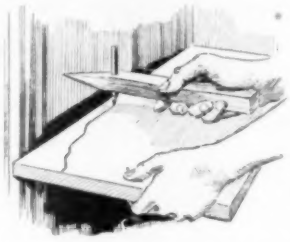
Omaha Garage Man Sets Up Useful and Novel Fence Consisting of Discarded Automobile Wheels, Painted White and Red, to Guard against Accidents at Ditch

Fence Made from Old Auto Wheels Guards Deep Ditch

To protect motorists from accidentally backing into a deep ditch just beyond his parking place, an Omaha garage man provided a fence made from old auto wheels, as shown in the accompanying photo. Besides being useful, the fence is novel and has attracted much notice. The wheels were taken from a junk pile and the spokes were painted white, while the centers and rims were in bright red. The wheels were held in place by the upper and lower rails of the fence over which the rims of the wheels fit snugly.—Geo. R. Harrison, Council Bluffs, Iowa.

Shelves for Odd Corners

Shelves for odd corners may be accurately fitted by following the method shown in the drawing. A small board, with a sheet of paper fastened to it by means of thumbtacks, is held in the corner. A short piece of wood, having one end pointed and a hole through it, as shown, is used to trace the contour of the corner on the paper. The paper, of course, is afterward cut and used as a template.—Charles I. Reid, New York City.



Cork Keeps Hook from Marring Screen Door

When screen-door hooks drop down, they often mar the paint of the door, and gradually cut disfiguring grooves in the wood. To prevent this, force a thin cork from a pop-bottle cap over the hook, as shown in the accompanying photo. The cork will prevent the metal from touching the door.

Repairing Auto-Radiator Leak

Some time ago the radiator on my car sprang a bad leak where the horn wires passed through it. As it was necessary to use the car immediately, a temporary repair had to be made. The leak was quite large, but a white potato, cut to fit around the hole, and a wooden brace, propped up against it, stopped the leak long enough to drive three miles to a garage.—Edward H. Buckley, Philadelphia, Pa.

Sled for Narrow Track Has Single Runner

When we wanted to visit our aunt and the cousins a mile away, it was necessary to go through a woods. During the winter months there is usually a single path to walk over, but our two little girls were too small to walk the entire distance. The use of a regular sled was also impossible as the path was too narrow, and therefore I made a single-runner "ski-boggan" as shown in the photo. Both youngsters could be comfortably seated in it, and the sled was held securely by means of a handle rigidly attached to the body.—J. J. Brindos, International Falls, Minn.

One-Runner Sled Solves the Problem of Transporting Children over Narrow Forest Path

Some Dry-Cleaning Tricks

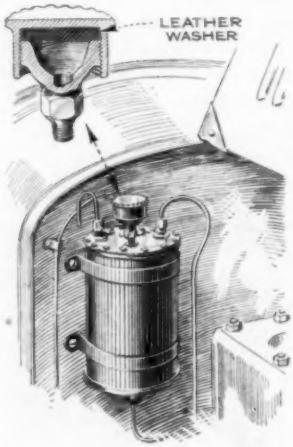
Often, when cleaning, it will be found that the color of a material will be slightly lightened. If the bleaching is not too noticeable, the color may be restored by rubbing the fabric with a piece of cloth, barely moistened with neat's-foot, cottonseed or olive oil. Before brushing over the light spot, rub the moistened cloth on another cloth several times to remove most of the oil. This is done after the dry-cleaning process, and must be repeated each time the garment is cleaned. To give crepes and other silk materials new luster, dip them in carbon tetrachloride, or gasoline containing 4 or 5 drops of one of the above oils. This is also done after they have been cleaned. Water stains on silks generally can be removed by scraping the edges gently with the finger nail or rubbing carefully with a rather stiff brush, such, for instance, as a new toothbrush.—A. T. Bawden, Belton, Tex.

How to Prevent a Frozen Oil Pump

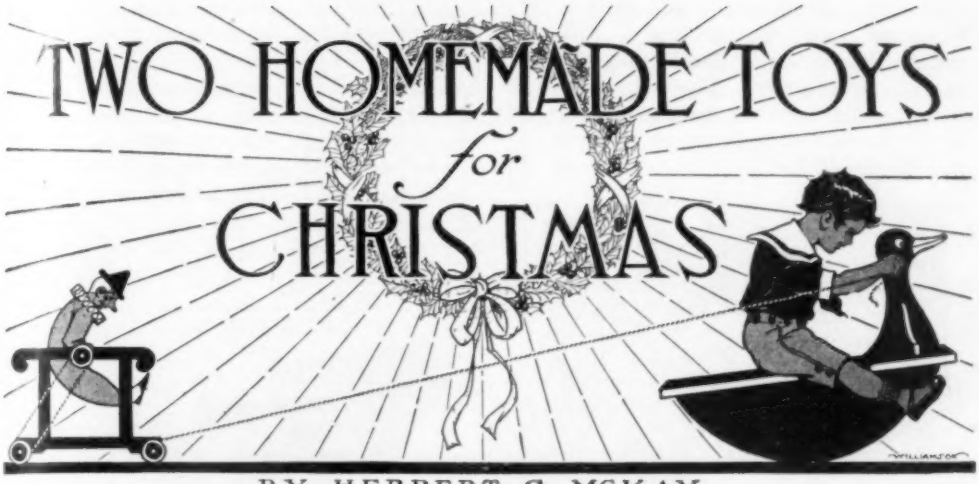
Water forms in the crankshaft case of automobile motors through condensation. The inside of the case warms up before the outside, thus creating small drops of moisture. This moisture naturally flows to the lowest point in the crankcase, which is around the oil-pump mechanism. Then the pump freezes every cold night, which means grave danger to the motor or expense and bother to thaw it out. To remedy the trouble, pour two tablespoonfuls of wood alcohol into the crankcase every two weeks in the winter time. The alcohol will not mix with the oil nor impair its efficiency. It simply sinks to the bottom of the crankcase, where it mixes with the water and prevents it from freezing. This is the only practical solution to the oil-pump freezing problem that I have ever come across.—Rolla H. Waffle, Walla Walla, Wash.

Grease Cup Helps Prime Vacuum Tank

When the vacuum tank is drained or the fuel supply is exhausted, difficulty is sometimes experienced in priming the tank, but by substituting a small grease cup for the pipe plug at the top, this difficulty can readily be overcome. As the hole in the top of the tank is tapped with a ⅛-in. pipe tap, the grease cup is easily screwed on. It is then a simple matter to pour in gasoline without spilling.—G. A. Luers, Washington, D. C.



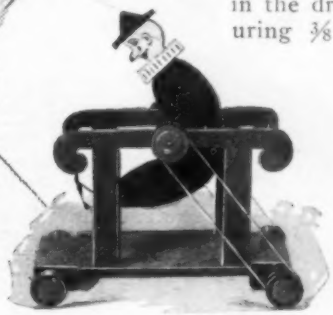
An ordinary curling iron makes a good finger stretcher for kid gloves.

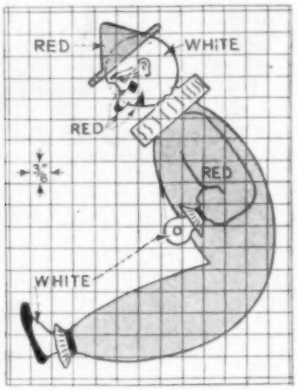


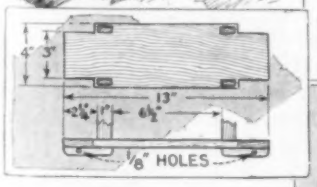
BY HERBERT C. McKAY

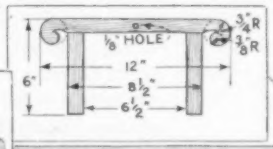
A TOY, that will be a delight to the youngsters, is the tumbling clown, shown in the illustration below. It consists essentially of a cart, the back wheels of which are belted to a shaft supported on the frame of the cart, a wooden figure resembling a clown being mounted on the shaft. When the cart is pulled, the shaft is turned and the clown swings head over heels, apparently holding onto the shaft.

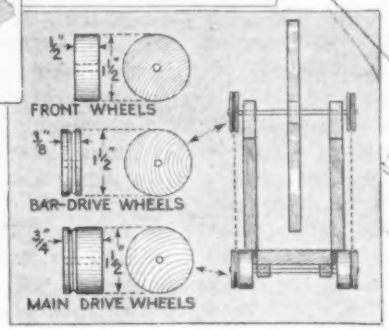
The clown body is cut from a piece of ½-in. wood according to the design given in the drawing, each division measuring ⅜ in. square. When com-

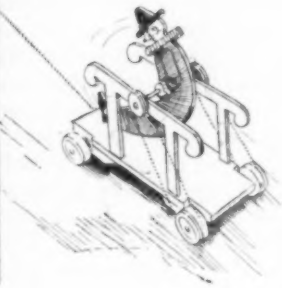








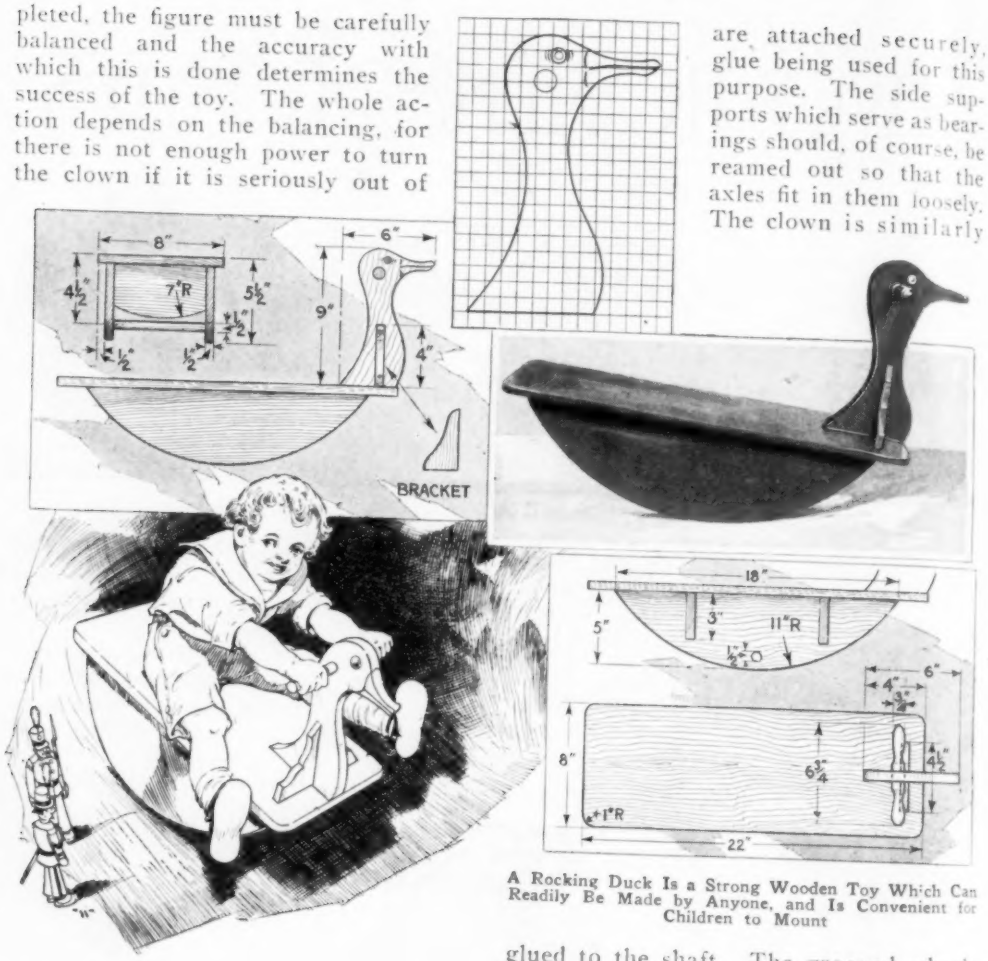




Tumbling Head over Heels As the Cart Is Pulled Along, the Clown Offers Constant Amusement to the Youngsters

pleted, the figure must be carefully balanced and the accuracy with which this is done determines the success of the toy. The whole action depends on the balancing, for there is not enough power to turn the clown if it is seriously out of balance. The center of balance lies somewhere in the hands and the exact point can be determined by driving two small pins into the hands, directly opposite each other, and testing the balance by suspending the clown from a string looped over the pins.

The wheels may be cut from a wooden curtain pole, the exact diameter being of little importance as long as sufficient clearance is provided for the base and the axle boxes. The drivewheels are ¾ in. thick, while the front wheels are ½ in. thick. A groove, about 1/16 in. in width and depth, is cut in the former to hold the drive belt. The parts are enameled and, after it has become thoroughly dry, the toy is assembled. The wheels are drilled in the exact center to receive the axles on which they are attached securely, glue being used for this purpose. The side supports which serve as bearings should, of course, be reamed out so that the axles fit in them loosely. The clown is similarly glued to the shaft. The grooved wheels must be in line and rubber bands are used for belts.



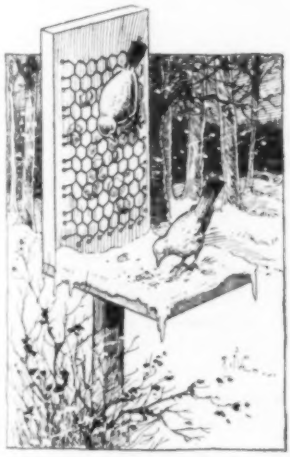
A Rocking Duck Is a Strong Wooden Toy Which Can Readily Be Made by Anyone, and Is Convenient for Children to Mount

Rocking toys will always be popular with small children, but the trouble with most toys of this kind is that the small child finds it hard to get in or out of them unaided. The rocking duck, shown in one of the illustrations, is not subject to this drawback. It consists of a seat, rocker, duck-head handle and the necessary braces. All the pieces, except the handle and one cross brace, are cut from ⅜ or ½-in. plywood. The seat measures 8 by 22 in., and the corners are rounded. The two rockers are 18 in. long, have a maximum width of 5 in., and are cut on a 11-in. radius. The seat is fastened to the rockers by nailing and gluing, and two braces, of the shape shown, are provided between the rockers. All parts are then

screwed together securely. A ½-in. round or square rod forms an additional brace at the bottom, as indicated. The duck's head is cut according to the pattern, each square being ⅜ in. in size. A handle is provided on the head as shown. This consists of a 6¾-in. length of ¾-in. wood driven through a hole in the head. The latter is securely fastened to the seat with three wood screws, and two braces are used to support it, one on each side of the head. The head may be painted white or yellow, the bill yellow and the features outlined in black. All the screw heads in the body are sunk below the surface, and the holes filled with putty. The surface of the wood is sanded and given a coat of flat white paint. After this has dried thoroughly, a coat of enamel may be applied, if desired.

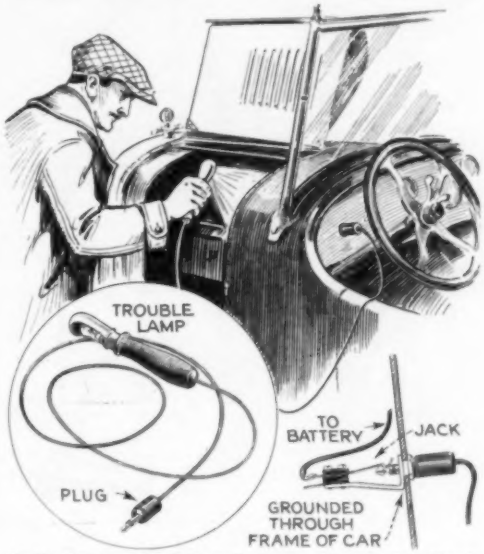
Winter Feeder for Birds

When the ground is covered with snow, birds often find it difficult to get food enough to sustain life. They eat suet and chunks of fat meat, and the feeder shown in the drawing is designed to hold this kind of food so that the birds can get at it at any time. It consists of a wide board nailed to a post in the vicinity where the birds congregate. A shelf should be built below it, upon which the birds can sit and eat the chips of fat, while other birds may cling to the poultry wire, which is nailed over the fat or suet on the vertical board. Use large-mesh wire and fasten it by means of flat-head nails, around which are wound all the loose ends of the wire, to prevent these from injuring the birds while perched on the feeder. The poultry wire holds the suet in place and protects it from stray cats and dogs. Raise the feeder as high as possible from the ground.



Plug and Jack for Auto Trouble Lamp

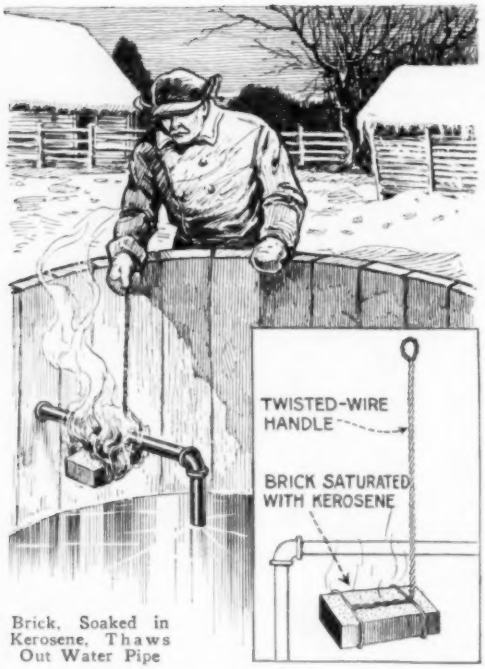
A plug and jack, such as used in radio sets for phones and loud speakers, can be installed in the car for use with a trouble lamp. A jack of the single-circuit type is obtained and is installed on the dashboard, or any other handy place on the car. Two or three jacks can be mounted at other points. A small hole is drilled and the jack is fastened with the large nut. This nut serves as one connection to the battery through the metal parts of the car. The other connection is made with a single wire to the battery. A phone plug is connected to the trouble lamp with an extension cord. Pushing the plug into the jack immediately lights up the lamp. When finished using it, pull out the plug. —Herman R. Wallin, Brooklyn, N. Y.



Radio-Plug and Jack Installation on Auto Makes Handy Trouble-Lamp Arrangement

Steel Wool as Furnace Repair

It sometimes happens that a poker or shovel is pushed through the lower casting around the ash pit in a hot-air furnace, making a hole that causes excessive draft. A satisfactory repair may be made by pushing some steel wool, soaked with iron cement, firmly into the hole, and smoothing over with the same cement. Stove lining may also be used, but it is not so permanent.—R. C. Tarr, Gloucester, Mass.



Brick, Soaked in Kerosene, Thaws Out Water Pipe

Brick Torch Thaws Out Water Pipes

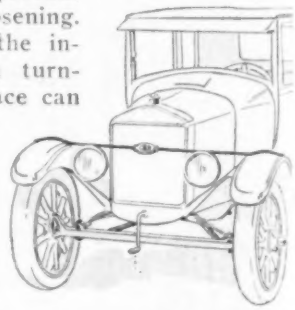
For thawing out frozen water pipes in cisterns, tanks and other places where an open flame will do no damage, a brick and wire torch will be useful. A dry brick is wrapped with several strands of heavy wire, the strands being drawn together at one side and twisted to form a convenient handle, as shown in the drawing. The brick is immersed in a can of kerosene and is allowed to remain there until thoroughly saturated. After that it may be lighted and used as a torch, as indicated. If the brick is dry when placed in the kerosene, it will cause numerous air bubbles to rise to the surface and, when these discontinue, it may be assumed that the brick is "saturated" and will burn long enough to thaw out the pipe.

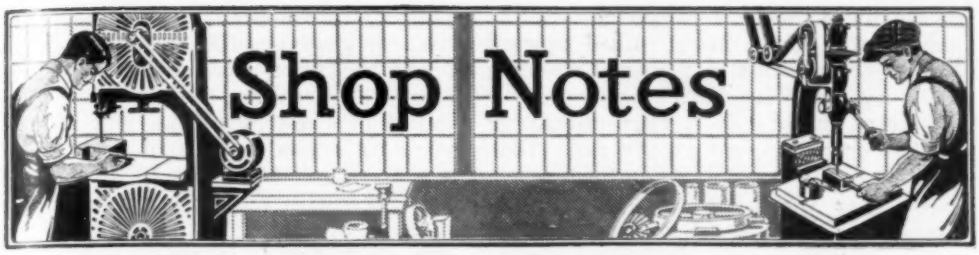
Uses for Alum about the House

Alum is used rather widely in the form of crystals to stop the flow of blood from small cuts after shaving, on account of its astringent properties, which also make it useful in the form of a solution as a non-perspirant and deodorant. A weak solution may be used as a gargle in case of a sore throat. A two-per-cent solution of alum makes an excellent spray for plants, as it kills aphids, plant parasites, and insects, but is harmless to the most tender plants. Powdered alum, poured in places frequented by insects, will keep them away effectively. It can also be sprinkled on carpets to eliminate fleas. A solution of alum will bleach ivory handles, but do not use it for celluloid, as it yellows that material. Many colors, particularly yellows, are brightened by the application of a solution of alum, and for this reason carpets are improved in appearance when brushed with it. Blacks, browns, grays, reds, pinks, greens and blues are set by alum. If brushed over flaky ceilings, a solution of alum will remove superfluous lime and will whiten them. Alum is also used as a size in whitewash and calcimine. A mixture of plaster of paris and alum makes an excellent cement. It is used in liquid form mixed with water. Powdered alum, melted in an old spoon and applied to the heated edges of broken glass and chinaware, will hold them together after it cools. Alum is also added to glues and paperhangers' pastes to improve them. Dresses, curtains, etc., can be fireproofed by soaking them in a solution consisting of a tablespoonful of alum to each quart of water. The durability of rubber can be increased by soaking it in a solution of alum occasionally.

Turnbuckle on Ford Fender Brace

Many Fords are fitted with a brace running across the front fenders to hold them in place and prevent them from loosening. However, by the installation of a turnbuckle, the brace can be made adjustable. The rod is prepared in the usual way, flattening the ends and bending them to conform to the top of the fenders, and then sawing the rod in half. About an inch of the rod is sawed off both lengths, and the ends are threaded for a turnbuckle, with which the brace can be tightened.





All Shop Notes published in 1926, in book form—Fifty Cents—from our Book Department

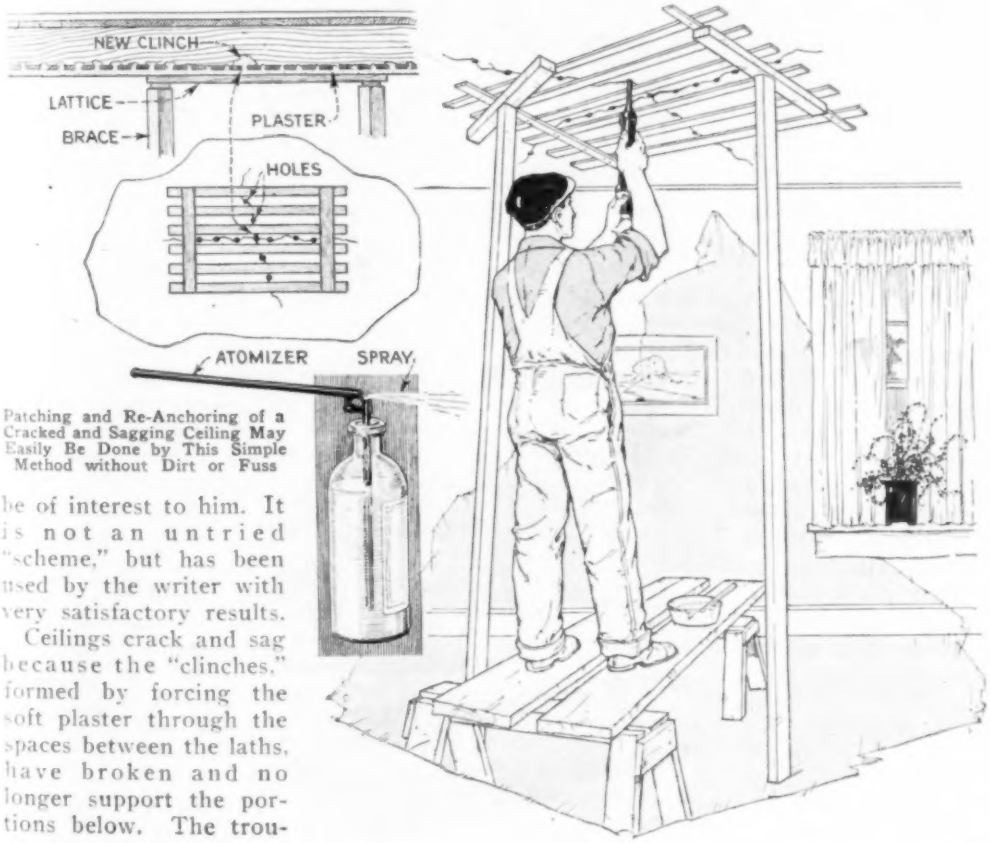
Repairing Cracked Ceilings

By R. L. WALES

CRACKED or sagging ceilings are not uncommon experiences to the average householder. As the customary method of repair—battering off the broken plaster and patching—involves clouds of dust which penetrate everywhere, as well as a considerable bill for labor, the following simple, quick and effective substitute will be of interest to him. It is not an untried "scheme," but has been used by the writer with very satisfactory results.

Ceilings crack and sag because the "clinches," formed by forcing the soft plaster through the spaces between the laths, have broken and no longer support the portions below. The trouble suggests the remedy; replace the clinches. The manner of doing this is illustrated in the accompanying drawings.

If portions of the plaster have begun to settle, it is necessary first to force them back into their normal positions and to support them there. For this purpose, a lattice of thin boards, like a section of a



Patching and Re-Anchoring of a Cracked and Sagging Ceiling May Easily Be Done by This Simple Method without Dirt or Fuss

picket fence, may be placed against the plaster, the lattice being forced upward and held in position by pieces of studding from below. The lattice supports the plaster at many points, thus preventing further cracking, and at the same time exposes enough of the ceiling for work.

After the broken plaster is forced back, a series of holes, about 6 in. apart, is made with a ⅜ or ½-in. twist drill along the entire length of the cracks, and at other spots where support is apparently needed. Some of these holes will come between the laths, thus penetrating the plaster only; in other cases, the drill will pass through the lath, or perhaps even the furring. Through these holes is introduced the material for the new clinches.

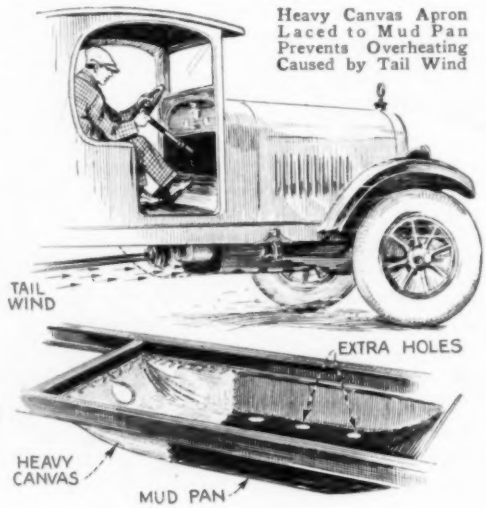
For the latter purpose, so-called "rock plaster" is sifted, to remove its content of wood fiber, and mixed with water to a very light consistency, so that it will flow fairly easily from the mixing spoon. This mixture is poured into an ordinary grease gun and forced through the holes prepared. The mix must be wet for several reasons; it must not choke the gun; it must be able to flow out over the laths and into the spaces between them, and it must carry sufficient excess of water to wet thoroughly the dry and powdered plaster with which it comes in contact and make a good bond with it. Charges of about one cupful each have been used with success. Of course, the plaster should be mixed in small quantities, and just previous to its use, as it begins to set within a short time. No difficulty has been experienced with the plaster running back through the holes on the removal of the gun, as "plugging" takes place quickly.

It remains simply to patch the holes and cracks with more of the plaster, using a putty knife and being careful to scrape off all excess from the surface. This is an important detail. After setting for twenty-four hours, the supports may be removed and the calcimine touched up.

If it is attempted to apply such materials in the usual way, with a brush, difficulty may arise due to the old coating "rolling up" and making it impossible to do a smooth piece of work. This may be avoided, and much time saved, by applying the material with an atomizer. For this purpose, the calcimine is mixed somewhat thinner than for ordinary use and is sprayed directly upon the patched spots and cracks without disturbing the rest of the field in any way. A simple and effective atomizer, suitable for small jobs, is shown in the lower left-hand detail.

Canvas Apron Prevents Overheating

A man who used to make daily round trips of 80 miles in one of the California valleys with a truck, noted that, on the return trip, when running light, the radiator water almost invariably would boil. Neither tightening the fan belt, changing the pitch of the blades, checking the circulation system nor fitting new hose connections remedied the trouble. At length, the source of the overheating was found to be a strong tail wind that blew up the valley every day. The wind would blow under the truck into the mud pan, "backing up" the hot air radiated by the exhaust pipe and engine itself, and preventing free circulation of air through the radiator core. To remedy this, a canvas apron was made and laced snugly to the rear end of the mud pan and to the cross member of the frame back of the gear box. A slot was cut for the drive-shaft and holes in the mud pan, as shown, to let out the heated air, where it would not be driven back.



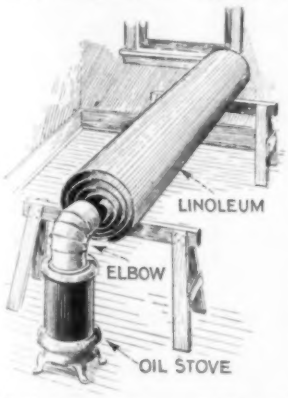
Heavy Canvas Apron Laced to Mud Pan Prevents Overheating Caused by Tail Wind

Removing Insulation from Magnet Wire

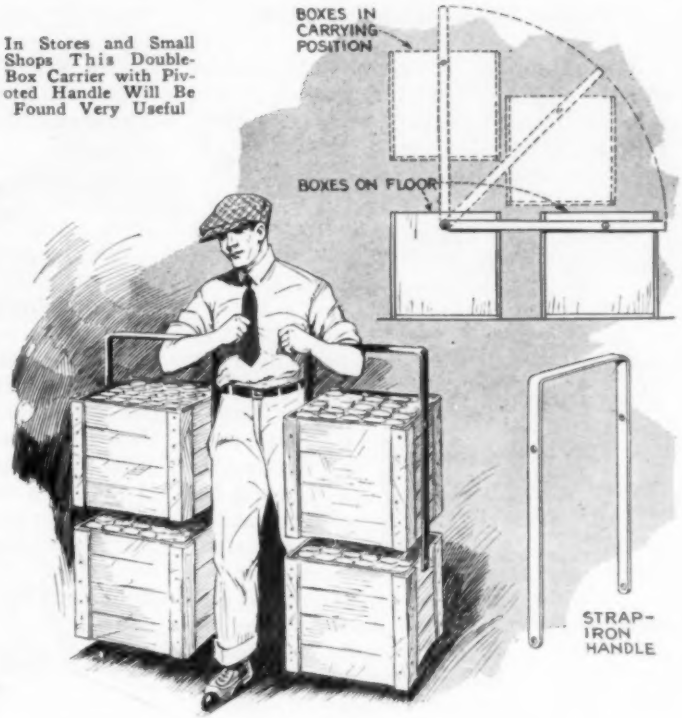
A good method of removing enamel or other insulation from magnet wire, especially when a lot of ends have to be cleaned for soldering, is to take a fine-tooth hacksaw blade, hold the blade in one hand and draw the wire over the teeth, holding it between the thumb and the saw teeth. This method is very rapid. The fine teeth will remove both cotton and enamel insulation in one operation, leaving the wire bright for soldering.

Heating Linoleum Facilitates Laying

An Illinois merchant, who makes a specialty of selling linoleum, contracting to cut and fit it to the floors, claims that success in laying it depends partly on its pliability, and therefore he makes a practice of heating it before attempting to lay it in place. A small oil stove is fitted with a large furnace-pipe elbow. While the room is being made ready to receive the linoleum, the latter is loosely rolled and supported on bucks, and the lighted stove is placed at one end, with the elbow directed to throw the heat into the roll. As soon as the heat from the lighted stove has penetrated the linoleum, and it is sufficiently pliable, the work of cutting and fitting is begun. With this method much of the usual guesswork is eliminated, and the floor covering is free from cracks.



In Stores and Small Shops This Double-Box Carrier with Pivoted Handle Will Be Found Very Useful



Double-Box Carrier

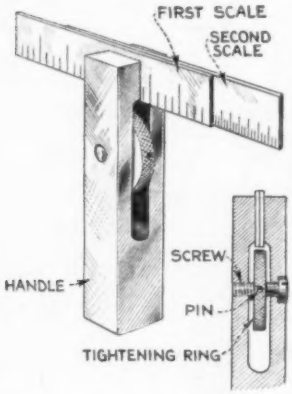
When boxes filled with light material have to be carried around the shop, it is possible to double the number that can be moved by one person by using a single handle for two boxes, as shown in the drawing. The arrangement is convenient, and when the boxes are being filled or emptied, the handle is entirely out of the way. To make a carrier of this kind place two boxes a proper distance apart, so that the top of one will clear the bottom of the other when the handle is raised to a vertical position. The handle is made of strap iron and is attached to each box with two screws, as indicated, to serve as pivots. With these handles one person can easily carry four boxes.

Effective White-Paint Cleaner

Place three small onions in a pan of water and boil them for some time until they are soft. Strain the liquid and use it as a cleaner for white paint. Neither powder nor soap is required, and the application does not need much rubbing.

Holder Makes Gauge of Scales

A handy addition to a tool kit is a holder like the one shown in the drawing. It is used for clamping two scales together, forming a useful gauge that can be adjusted to suit many types of work. For example, when turning shoulders in the lathe, it is much easier to measure from one shoulder to the other by using the ends of two scales suitably clamped at the proper dimensions than by the use of one scale, in which case the lines must be located with the eye. Similarly, two scales are handy for setting collars the proper distance apart, or for cutting off lengths of stock, and for many other uses that will readily occur to the machinist. The type of holder shown is a good one, because it leaves one side or edge of the scales free to be laid flat on the work and also because it is neatly arranged so that there are no unnecessary projections. Take a piece of square or round stock, slot it for the scales and drill out a clearance slot beyond it. Drill and tap it through for a tightening screw and make a knurled ring to fit the screw shank. Assemble the parts as shown, with a pin through the ring and the screw. To measure the distance between two shoulders, which must be finished, for instance, 8 5/64 in. apart, use two 6-in. scales. Set one of them out 2 5/64 in., and by turning the knurled ring, clamp them together at this distance. The clamp, of course, is a handle as well and will facilitate the work.



Making Screws Hold in Soft Wood

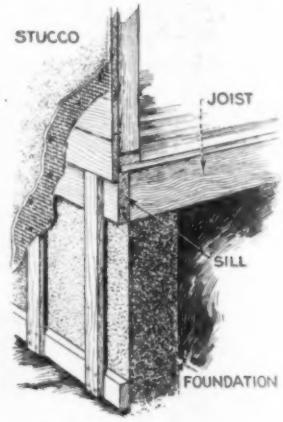
When wood screws are driven into softwood articles, that are in constant use, the screws often work loose. This trouble can be eliminated in the following way: Melt a small quantity of rosin in a metal pot and apply some of it, while hot, on the screw about half of its length, just before driving the screw home. This method is better than the use of a rosin-coated nail, driven in cold.

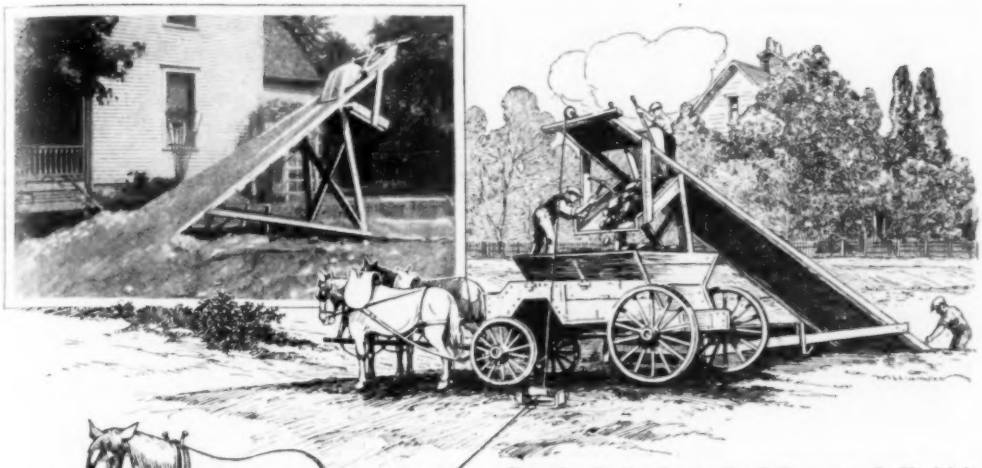
Mirror Useful When Working behind Instrument Board.

When a fuse blows out, a wire becomes disconnected or any other trouble develops behind the instrument board of an auto, it is a difficult task to see and reach the part to be fixed. It means lying on the back in a cramped position in the car with your head in darkness so deep that it is almost impossible to see. It is a good idea to use a small mirror, holding it in the hand or resting it so that the light will be reflected up behind the board. The parts will then be illuminated and the work can be seen in the mirror.—L. B. Robbins, Harwich, Mass.

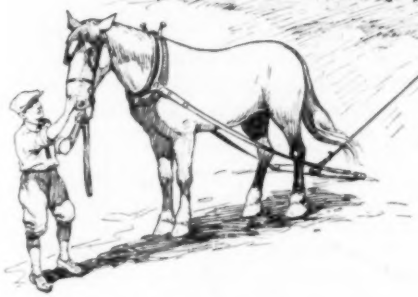
Air Space around Foundation Has Advantages

Provision of an air space around a foundation, as shown in the illustration, has several points of advantage. Greater warmth is assured as the frost will not penetrate the wall and leave a coating within. It is also a guard against dampness. Likewise, stucco applied to the lower section will not crack, as is often the case where it is used on the flat wall. The drawing shows how the sill comes outside of the foundation edge and the joists are flush with the edge of the foundation. A piece of 2-in. material runs along the foundation at the bottom, and furring strips are nailed from the sill to the bottom piece. The wire lath covers the whole of this and continues up the wall without interruption.





Dumping Incline for the Small Contractor Is Useful for Excavations and Saves Considerable Time and Labor

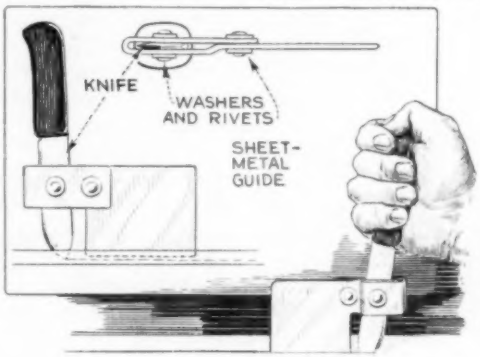


Homemade Loader Saves Time for Contractor

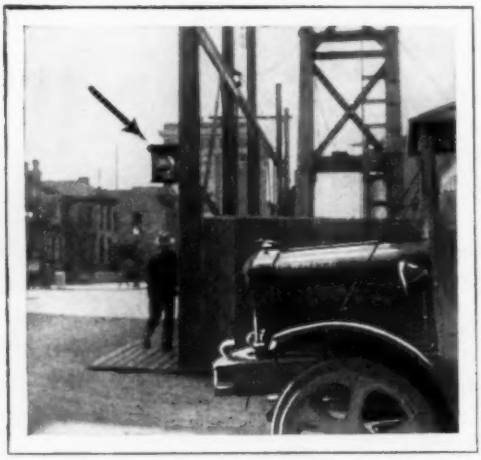
One contractor, who had a number of basements to excavate, decided to build his own dirt loader and save time and labor. The soil is first loosened up as usual with a plow. This is then scooped up in a scraper, and by means of a long cable, running on a pulley at the top of the loader, is drawn up an incline. The scraper is tripped at the top of the incline, the dirt falls through an opening and slides down a slanting trough directly into the truck or wagon waiting beneath. Two 4 by 4-in. timbers are used for the uprights that support the incline, and are cross-braced by 2 by 6-in. planks. The incline itself is made from 2 by 6-in. planks with 2 by 4-in. joists for reinforcement. As soon as one excavation is completed, the timbers are quickly knocked down and removed to the next field of operation.—J. Coohon, South Bend, Ind.

Attachment Guides Cutting Knife

To make it easier to slice long straight lengths of leather, rubber or similar material, a guide for the knife will be found useful. The one shown in the drawing does away with the need for a straightedge, which is a difficult thing to hold while running the knife along. With this attachment it is only necessary to use a straightedge for the first couple of inches or so, when it is discarded and the slicing continued after placing the guide in the initial cut. To make this handy attachment, a piece of sheet steel is cut out and bent around the knife. A lap is left to be riveted to the guide proper. In use, the guide piece is placed in the first cut, and the slicing can be continued in a straight line. It is best to hold the guide in the cut lightly with one hand, and not to cut the material quite through at first.



Simple Guide on Knife Helps to Cut Straight



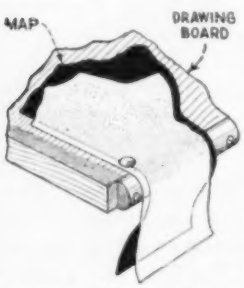
Mirror at Gateway Permits Truck Drivers to See Passing Autos and Avoid Accidents

Mirror Prevents Auto Accidents at Gateway

In the construction of a large office building in Denver, Colo., it was necessary to make a gateway in the high board fence surrounding the building site, to allow the passage of the material trucks. As the fence took up a large portion of the already narrow street, the trucks, emerging frequently into the stream of traffic, were a source of considerable danger to passing cars. The danger was eliminated by placing a large mirror on a post at the right side of the gateway, which enabled the truck drivers to see approaching cars before driving outside.—Jos. C. Coyle, Denver, Colo.

Improving the Drawing Board

When large drawings or maps are to be made, the draftsman often has trouble from the drawing creasing at the edge of the drawing board. A simple remedy is shown in the illustration. A semicircular strip of wood, such as a broomstick planed down, is screwed to the front end of the board. This rounded edge allows the drawing paper or map to hang over it without creasing.



Effective Method for Preventing Wood Rot in Posts

Paint does little good to prevent wood rot in posts, which are placed sufficiently deep to be rigid. A method has been discovered, which is highly effective, as it practically covers the end of the post with stone. Mix in an iron pot 50 parts of rosin, 40 parts chalk and 4 parts linseed oil. After these ingredients have been thoroughly mixed, add first one part cupric oxide and then, very carefully and slowly, one part of sulphuric acid. Stir this until it is well mixed. Apply the warm mixture to the post ends with a brush. The coating dries very hard, and posts so treated will not be affected by wood rot. Another advantage is that the work can be done more quickly than in other ways.—L. H. Georger, Buffalo, N. Y.

Handy and Economical Oilcan Spout

The writer has never encountered an oilcan of a practical size for the bench having a spout opening which would drip oil on a stone exactly right, that is, drop by drop. The openings are always a little too large. When the light oil used for such a stone is warm, it gushes from the can, no matter how careful one may be. The trouble can readily be remedied in the following way: Clip the small three-pronged retainer from the end of an old tire-valve core and force it snugly over the end of the oilcan spout. There is a small hole in these little pieces which just allows the oil to flow in drops as you want it to. It is very quickly taken off if the can is wanted for oils of different nature and purpose. This method saves oil and the stone is never flooded.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

Fluids for Drilling Glass

Several fluids are used for drilling or filing glass, of which vaseline oil and a solution of camphor mixed in spirits of turpentine are the most common. A French scientist recommends a solution of 30 gr. of camphor and ½ fl. oz. of sweet-almond or olive oil in 7 fl. oz. of benzine. This mixture will not deteriorate, renders filing and drilling easy, and can be removed from the glass by simply dipping the latter into benzine. The vaseline oil is more or less objectionable because it leaves the glass greasy, and the solution of camphor in spirits of turpentine is unpleasant to use because of the disagreeable smell.

Whitewash Makes Breeding Places for Chicken Mites

When an ordinary mixture of whitewash is used to disinfect the interior of a poultry house, it usually leaves minute scales or blisters. Millions of mites may breed and multiply in these blisters, safe from subsequent sprayings of insecticide. To overcome this, mix about 2 per cent or more of sizing glue with the whitewash. This will serve as a binder, and a thick coat of whitewash will dry smooth without scales or blisters.

Improving Corn-Crib Sill Construction

The sill construction of a slatted type of corn crib shown in the drawing will add years to its service. The lower board is a wide one, and is nailed on at a slant so that it extends over the box sill. This prevents water from dripping on the sill, and as the life of the sill really determines that of a crib, safeguarding it against rotting is highly desirable. The construction also simplifies the joining of studdings and sills.—Louis Schneider, Clinton, Mo.

Efficient Lawn Roller Made from Old Oil Drum Filled with Water

Homemade Water-Ballast Lawn Roller

A water-ballast lawn roller may be readily made at little or no expense. The writer obtained a discarded 15-gal. oil drum, on each end of which a piece of ⅝-in. wood, about 5 in. wide, was snugly fitted inside of the rim. Holes were drilled through the center of two wooden barrel bungs and ¼-in. bolts were fitted through these holes. The bungs, nailed to the strips of wood attached to the drum ends, served as hubs and axles for the shafts of the handle. A discarded awning frame was used for the handle, the "eyes" on each end of the frame being placed over the axles and fastened with washers and nuts. If an awning frame is not available, a suitable handle may be made either of wood or by using a length of pipe, bent at right angles, and running a piece of heavy galvanized wire through it. An eye is twisted on each end to fit the axles and the handle is fastened with washers and nuts. The roller may be filled with water or sand.—David W. Murdock, Brooklyn, N. Y.

¶Cotter pins rubbed in graphite will not rust and are more easily removed.

Rubber-Tired Wheelbarrow

A motorcycle wheel on a wheelbarrow makes it easy-running and noiseless. When

Pneumatic Motorcycle Wheel Attached to Wheelbarrow Provides Comfort for Worker

a bump is hit, it does not jar the user like the ordinary iron wheels. Such a wheel is easy to attach.—Carlton Groat, The Dalles, Oreg.

Old Culvert Pipe Makes Inexpensive Gauge Chamber

The accompanying photo shows how old culvert pipe can be used to advantage in the installation of a water-stage recorder. The gauge mechanism is mounted in the upper end, where it is protected from the weather by a conical sheet-iron roof, riveted or bolted to the pipe, and easily reached through a swinging door cut in the side. The float moves up and down in the lower portion of the pipe as the water rises and falls, the bottom being left open to admit water from the stream. Circular iron straps, bolted to the timber heading, dam, or bridge pier, as the case may be, hold the pipe rigidly in a vertical position. Such installations are inexpensive and can be used on irrigation, drainage, power, or navigation canals; on small creeks or rivers, or on swamps, lakes and reservoirs.

Water-Stage Recorder Mounted in a Section of Old Culvert Pipe

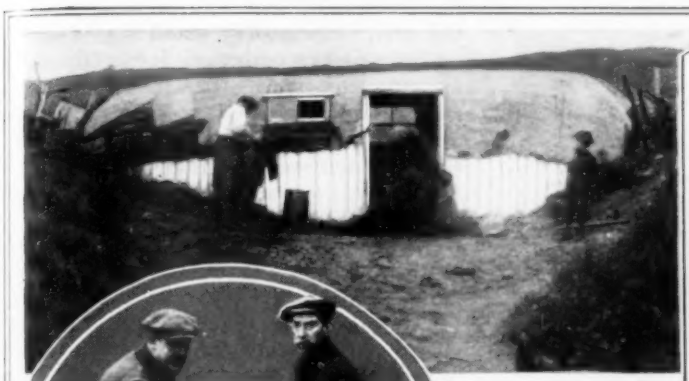
Cleaning Casting Dies on Linotype

When the casting dies on a linotype become clogged, they can be cleaned very quickly by coating them with blue ointment, letting them stand for a while, then rubbing off the ointment with a clean cloth and brushing with a stiff brush. Blue ointment is a compound of mercury and can be purchased at any drug store. When it comes in contact with type metal it softens this, or forms an amalgam, which is easily brushed off, taking the dirt with it. Operators of linotype machines will find that this method saves a lot of time and hard work.

Plow Pins for Cultivators

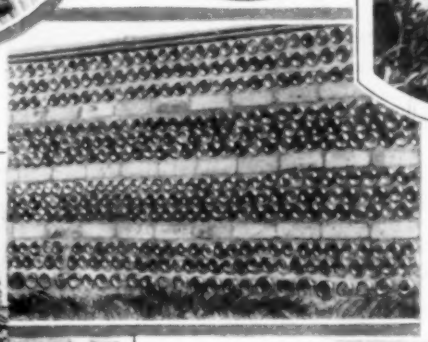
Most cultivators have wooden pins to hold the plows. This is to protect the plows in case they hit a rock, in which case the pins break. The pins are usually cut or split from a hardwood block. As they are then square they must be made round to fit the plow. Heretofore I have used a knife for this purpose, but it is a hard job and takes time. One day, when out in the field without any knife, I found that there were several holes in the cultivator frame. By driving the square pin through one of these, a neat round pin could be made. Of course, a hole of the right size must be found. In case there is not such a hole, a piece of flat iron with the right-size hole drilled in it, should be bolted at some place on the frame.—Wilfred Sorensen, Humboldt, Ia.

New Uses for Old Junk

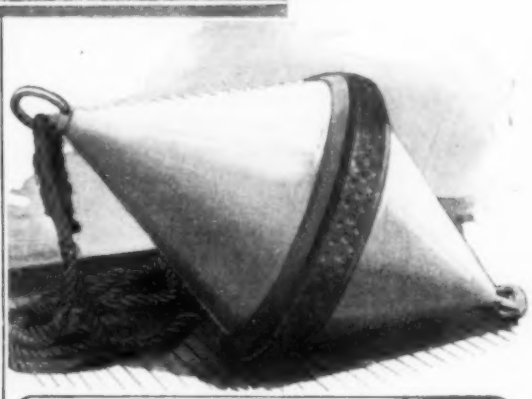


Above, Old Fishing Boat Makes a Good "Sea House"; Right, Effective Scarecrow Made from Dressmakers' Form

Old Tin Cans, Melted and Run into Molds, Make Paving Blocks

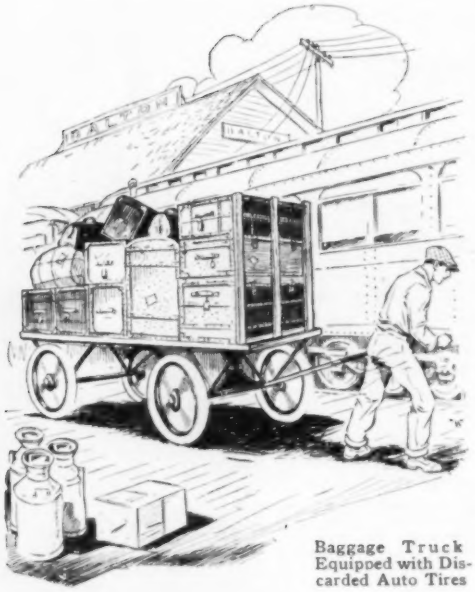


Left, Old Bottles Built into Concrete Wall Reduce Cost



Left, a High Horseshoe Pile Advertising the Village Blacksmith; Above, Old Auto Tire Makes Effective Bumper for a Motorboat Buoy

Copyright, Keystone View Co.



Baggage Truck Equipped with Discarded Auto Tires

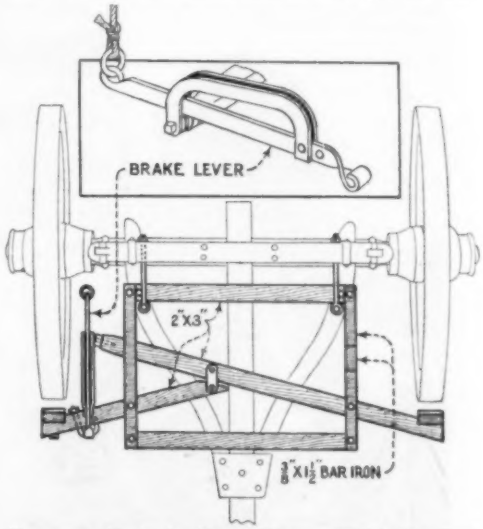
Rubber-Tired Baggage Truck

To prevent jarring of baggage, one baggage agent uses discarded auto tires on the wheels of the trucks. Equipped in this way, the trucks can handle greater loads with less danger of the baggage falling off. A test was made on a load of milk cans and not a drop of milk was spilled. The rubber-tired trucks are also silent and can be drawn past a sleeping car without disturbing the occupants.—W. N. McCoy, Little Rock, Ark.

Effective Wagon Brake

A general outline of a simple but effective wagon brake is shown in the illustration. Its construction is such that a slight pull on the lever causes the brake blocks to press tightly against the wagon tires. The lever is quite short, occupying only a little space, and the whole fixture requires less room than the average homemade brake. No pole projects upward above the level of the bolsters or above the wagon box, to be in one's way while loading the wagon. A rope, tied to the rear end of the lever, extends to the front end of the wagon, where it is accessible to the driver, who can operate the brake equally well for either running gear or wagon-box hauling. The rope is tied to the right-hand standard, to keep it at a point where the driver can readily reach it.

None of the materials required for the construction of this brake are hard to obtain. The hardwood used is 2 in. thick and 3 in. wide. Four iron bars, ⅜ by 1½ in., are required, two of them being used on top and two beneath, to keep the brake-block holders in the desired position. Two thin iron bars, bent to the shape shown in the illustration, are used as a support for the brake lever, and also to connect the brake-block holders, and they provide a sort of rack for the lever when it is idle. These pieces are attached to the short block holder by means of a U-shaped bolt, and to the longer one with a lag screw. The timber into which the lag screw is driven is banded at the end to prevent it from splitting. The block holders are further connected by means of two bolts and two short straps at a point near the center of the wagon. Pieces of an old casing should be nailed to the brake blocks, to prevent wear of the wood. The illustration does not show the detailed construction of the brake, and few of the dimensions are given, but



Homemade Brake for Heavy Wagons Which Has Been Found Very Effective

one should be governed by the size and kind of wagon, when determining the sizes of the parts to be used. The brake can be made adjustable by drilling more than one hole near the front end of the lever, where it is given a quarter twist.

Pulling the lever forward causes the brake-block holders to come close together at the lever end of the brake, and thus makes the blocks bear against the wagon tires. Be sure that the brake blocks are close enough to the wagon tires before deciding the location of any holes, as these will influence the size of the openings between the blocks and tires.—Bunyan Kennedy, McCool, Miss.

Curing a Waterlogged Hydraulic Ram

Many farmers have difficulties with hydraulic rams after a short period of operation. The ram seems to lose its efficiency and finally the flow of water stops almost entirely. This, in many cases, is due to the stopping of the snifting valve—a plug usually found screwed into the base of the ram with a very small hole drilled through it. This admits air to the air chamber of the ram at each stroke and, if it becomes clogged, the ram will not operate. It is also possible that the waste water from the ram, running past the plug, will cover the hole, and this would have the same effect as plugging the hole with refuse. Keep it clear, and you will find that the ram will work satisfactorily.—L. B. Robbins, Harwich, Mass.

Handy Pipe Rack

Odd lengths of usable pipe and stock rod often lie around in the small shop, where they may roll over the floor and get in the way. I took a number of discarded old-style brake-band lugs from Fords and spiked them to the wall, as shown in the photo, making several tiers. In this way the pipe and rod were separated so that I could find what I wanted without any trouble, and the material was also entirely out of the way.—Frank W. Bentley, Missouri Valley, Iowa.

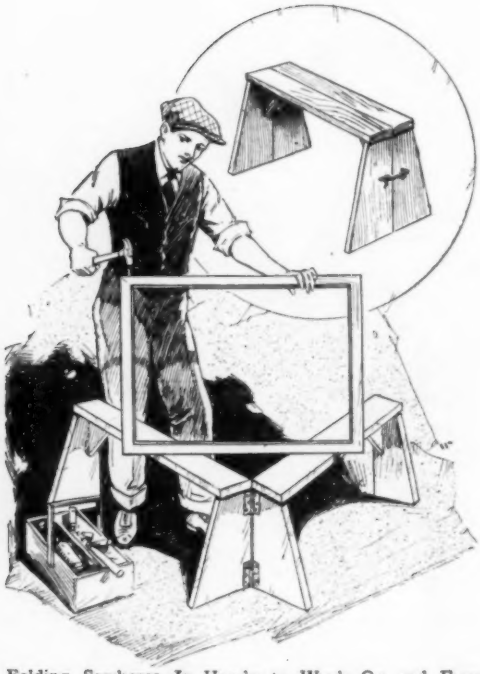
Simple Method of Driving Long Pipes or Rods with the Aid of a Block

Driving Long Rods into the Ground

It is almost impossible to drive long poles into the ground from the top of a ladder; sometimes the pole breaks, the top is badly marked up or the rod bends. A simple method of driving long poles or rods into the ground without such effects, consists in using a block of hardwood, cut and grooved to fit the pipe, rod or pole, as shown in the illustration. The block is slipped on the pipe or rod from the bottom. Moving it up does not cause the chains to bind, but as soon as a downward force is applied, the block is wedged tightly against the pipe, which can then be driven down by striking the block as shown.—L. H. Georger, Buffalo, N. Y.

Radium-Headed Tack on Door

Half-open doors may cause considerable injury when one walks against them in the dark. After several painful hurts, I placed a radium-headed thumbtack on the edge of the door, at eye height. This can readily be seen and will prevent collisions.—Leon I. Thomas, Oak Park, Ill.



Folding Sawhorse Is Handy to Work On and Easy to Carry Around

Folding Sawhorse for Small Repair Work

For general repair work, especially on jobs away from the shop, a Wisconsin carpenter employs a sawhorse of hinged construction, so that it serves the purpose of two. The horse is made as shown in the accompanying illustration, and may be opened or closed to accommodate the size of work being done on it, and to facilitate moving it from place to place.

Cautions in Use of Anti-Freeze Solutions

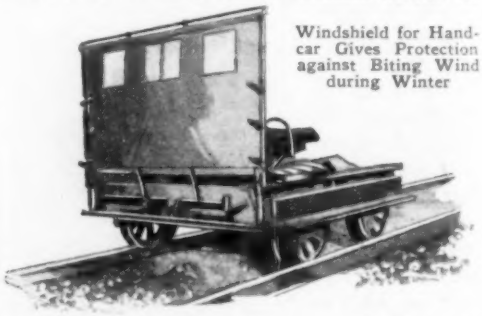
Cold weather to the car owner means replacing the water in his car with some form of anti-freeze solution. While alcohol was once the main stand-by, every winter sees a number of new preparations placed on the market as substitutes, claiming various advantages. One thing that seems to be common to the majority of them is that they will leak out of a radiator that is water-tight, and to prevent this, some form of radiator liquid is often used to seal the leaks if they cannot be stopped in any other way. In such a case, however, much trouble can be prevented if the two liquids are tested chemically before the mixture is placed in the radiator. One motorist was not only stalled many miles from home, but had to replace an expensive aluminum cylinder head because the solution had so corroded the metal during a few hours' standing, that it broke down as soon as the car was run, and flooded the cylinders with liquid. Both liquids were safe in themselves, but combined chemically to the detriment of the aluminum.—Harold E. Benson, Denver, Colo.

Special Wax for Filling Pits in Varnish on Pianos

If the varnish on a piano has pitted, fill the pits with a wax made as follows: Melt ½ oz. of carnauba wax, 2 oz. japan wax, or white beeswax, and 2 oz. of ceresin wax in a suitable vessel. A good method is to place one vessel inside of another, place hot water in the outside one and the wax in the other, then set them both on a stove. When melted, add enough kerosene to form a mass like petroleum jelly, when cool. This may be tested by placing some of it on a piece of glass and letting it cool. If it seems too hard, add a little more kerosene. Rub in on the piano with a wool pad, giving two or more applications until the pits are filled.

Windshield for Handcar

A windshield for a handcar will give the men working in railroad yards much comfort during the cold winter months. It is simple and inexpensive to make and should be of interest to section hands in railroads working in the open. It is made of either canvas or light wood, and has celluloid or glass panes to permit a clear view of the track ahead.—W. H. Soames, Minneapolis, Minn.



Windshield for Handcar Gives Protection against Biting Wind during Winter

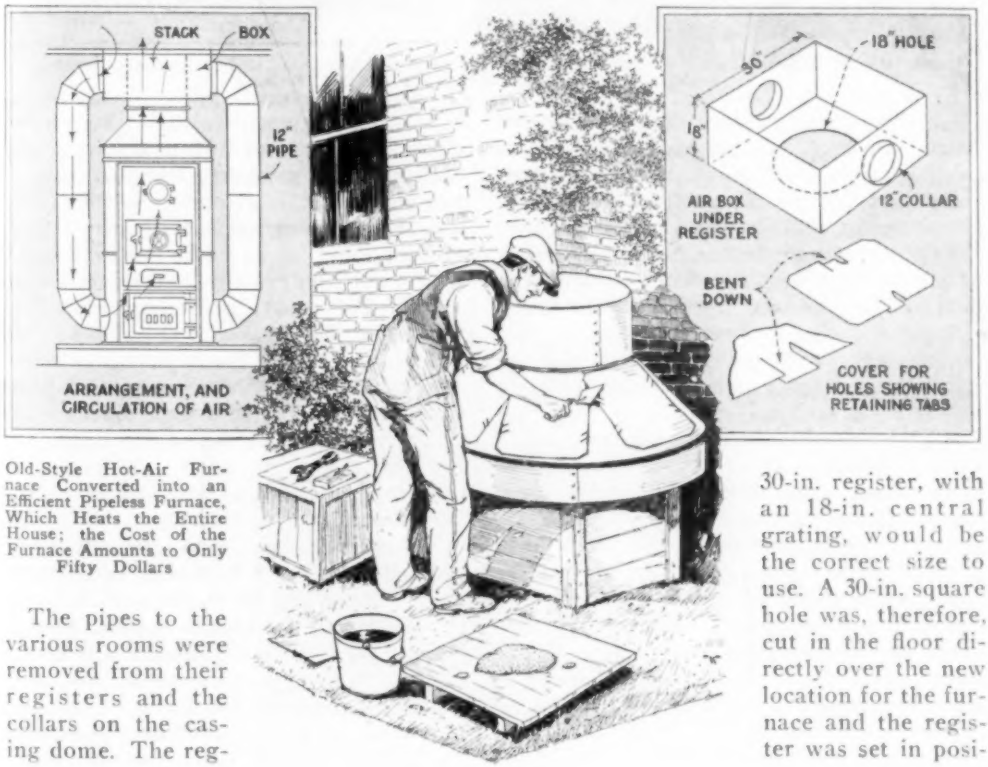
Pipeless Furnace Made from Old Heater

By L. B. ROBBINS

UNABLE to heat his house properly with an old-type of hot-air furnace, the writer, with little work, changed it into a pipeless furnace, which has given entire satisfaction. The same firepot and stove castings were used, but the casing was altered in order to eliminate the individual pipes to the different rooms. The converted furnace has heated the house to a normal 70° and higher, even during extremely cold weather.

It is not necessary to tear out the old heater entirely. If the firepot is large enough, you should have no difficulty in heating your home either to normal temperature on less coal or higher on the same amount. The advantage of the new installation is that all the heat is discharged into the house through one register, and that the return pipes conduct the air back to the furnace for reheating, establishing continuous circulation.

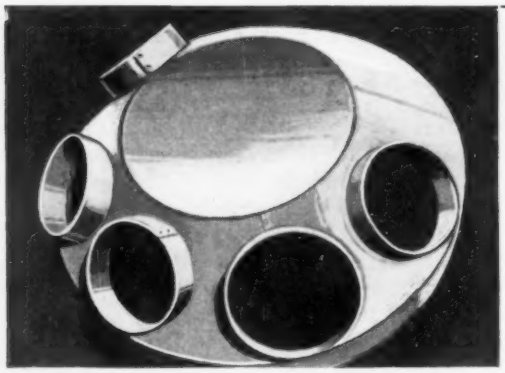
isters were taken out and the holes boarded up to match the floors. The casing around the firepot and the radiator casting was disengaged by removing the bolts which held it in place. As each piece was taken off, it was chalked with an identifying mark to avoid mistakes when reassembling. Next, the sections of the stove were taken down and the joints thoroughly cleaned of old cement and soot. The proper location for the heater must then be determined. In my case, the register was put on the west side of the house, midway between the north and south ends, because the prevailing winds are from the west and thus strike the warmest side of the house and spread the heat evenly through the entire building. Always a spot should be chosen that will promote even radiation and ready ascent of the heat to the second floor. My old furnace had an 18-in. firepot, and I found that a

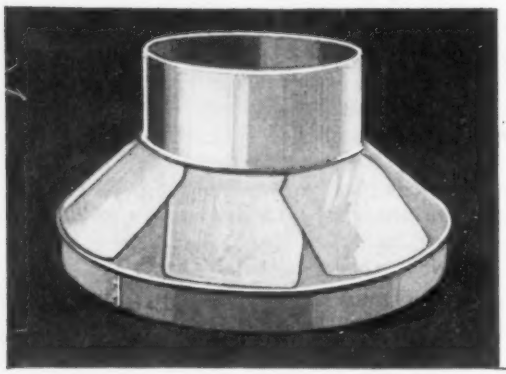


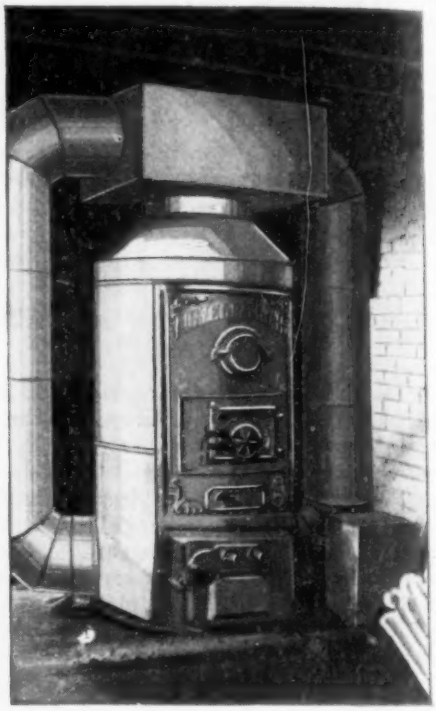
Old-Style Hot-Air Furnace Converted into an Efficient Pipeless Furnace, Which Heats the Entire House; the Cost of the Furnace Amounts to Only Fifty Dollars

The pipes to the various rooms were removed from their registers and the collars on the casing dome. The reg-

30-in. register, with an 18-in. central grating, would be the correct size to use. A 30-in. square hole was, therefore, cut in the floor directly over the new location for the furnace and the register was set in posi-







Left, How the Pipe Collars on the Dome Are Closed by Pieces of Sheet Iron; Right, Completed Installation, Showing the Pipes That Return the Air for Reheating

tion. The castings were then reassembled under the hole. Plenty of furnace cement was used in all the joints, and any suspicious crack was also filled with cement to prevent gas leakage. The exact center of the stove was determined by dropping a plumb bob from the center of the register. The collars were then removed from the casing dome. The edges of the holes were hammered smooth, and square pieces of galvanized sheet iron were cut to cover each with a 1-in., or wider, overlap on all sides. A couple of slits were made in two opposite sides of each piece to form lugs which were slipped under the edge of the hole and pressed up from the inside. These held each piece securely. Just before this was done, however, the underside of the piece of sheet iron was well smeared with cement. When the job was done and the piece clamped in place securely, the cement hardened and made a perfectly gas-tight joint. The detail drawing and the two photos show how this part of the work was done.

Lastly, the entire circular top of the dome was cut out and a collar was attached. This measured 18 in. in diameter, the same as the diameter of the firepot. An 18-in. galvanized sheet-iron stack was riveted together and left long enough to fit closely against the register when the rest of the furnace was completed. With this done, the casing was replaced with new bolts, and the dome put on as before. Short pieces of wire were wound about the bolts at the front and chicken wire was wrapped ab ut the casing tightly and held by the short wires. This was for the proper support of an asbestos plaster, which was later applied.

To complete the arrangement, a galvanized sheet-iron box was constructed, 30 in. square and 18 in. deep. The drawing illustrates the box in detail. The upper end was left open, but the bottom was closed by a sheet pierced in the exact center by a round hole, 18 in. in diameter, which was intended to fit over the heater stack. In each of two opposite sides a

12-in. round hole was cut and fitted with a collar. The box was slipped down into the register hole and the top edges of the box were nailed to the inside edges of the opening, about ½ in. below the floor level. The heater stack was then inserted through the hole in the bottom of the box and fitted over the 18-in. collar on the top of the furnace dome. A length of 12-in. pipe and the necessary elbows connected the 12-in. collars on the sides of the box to corresponding 12-in. collars on the bottom of the furnace. The finished assembly is clearly shown by the photo and drawings. The entire furnace casing, as far up as the bottom of the box, but not including the 12-in. pipes, was covered with a 1-in. layer of asbestos plaster, mixed to a paste form in water and applied with a trowel. When it dried, it was given a coat of white cold-water paint. The smoke pipe was fitted with a check damper that could be operated by a chain from above for regulating the draft without going down into the basement.

The drawing shows the circulation of the air, which compares very favorably with the double-casing system of the typical pipeless furnace. The heated air rises directly into the rooms and, when cooled, flows along the floors, down the outside edges of the register into the box and, through the 12-in. pipes, to the bottom of the casing where it is reheated and again rises into the house. This action continues as long as there is fire in the furnace. The cost of making this installation was less than $50 and has well repaid the trouble. Practically all the heat generated in the firepot is utilized and the fuel cost is reduced considerably.

¶All metal patterns should be thoroughly cleaned with a stiff brush having plenty of beeswax on it and dipped in powdered plumbago, to draw easily.

Piano Stool Handy as Tool Holder

By utilizing a piano stool for a tool holder, as shown in the drawing, a garage man found that tools can be kept handy with less risk of losing them. The stool is fitted with a rim separated from the top by a 1-in. space. This was done by nailing four 1-in. blocks equidistantly about the edge of the seat and nailing a barrel hoop to the blocks. The tools were hung in this slot, and the seat could be turned to bring any one of them within easy reach. The stool could also be used by the repair man as a seat, if desired, by pushing some of the tools together on one side.

Clamp Holds Auto Hood

When working about the engine of a car, most garagemen prefer to remove the hood entirely to eliminate the necessity of raising and lowering the sides as occasion demands. An Illinois mechanic improvised a simple holder by means of which both sides of the hood can be kept open without danger of falling while the repair work is being done. It is simply a length of ¼-in. steel rod, bent to the shape shown and having lengths of rubber tubing slipped over the "legs," to avoid scratching the hood. In use, the sides of the hood are raised and the tool is slipped down over them like a huge clothespin.

Simple Device Holds Both Sides of Auto Hood Up Securely without Marring Finish

Drainage-Canal Banks Built at an Angle of 45 Degrees Are Most Economical

Most Economical Shape of Canal Found by Experiment

A western irrigation district recently concluded that the most economical shape for a concrete-lined canal is one with the banks sloping at a 45° angle. Such a shape allows the concrete lining to be built without forms, while the operation of the canal is fully as satisfactory as it is in canals of other shapes. This was determined after observations on the experimental canal shown, which was built with banks of different slopes.

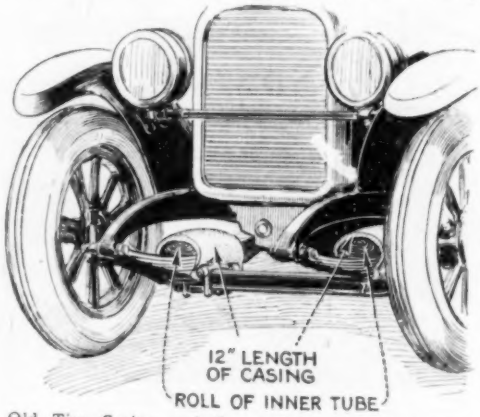
Clearance of Milling Cutters

In grinding the clearance on the cutting edge of milling cutters, sufficient attention is usually not paid to the angle or exact amount of clearance the cutter will have on the work. This is a very important matter, as too much one way or the other will result in failure of the job. If the clearance is too great, the cutter will have a tendency to chatter and make a rough finish, to say nothing of the disagreeable noise, and the loosening up of the bolts and clamps on the machine will cause the heel of the land to drag, making an uneven surface, and is liable to break the teeth. The angle depends, to a great extent, on the diameter of the cutter and also on the material it is to cut, although, in general, milling cutters are used on almost anything that can be cut, making regular shapes, while in those that are made up for a special job and used for that purpose only, more attention must be given to the kind of material to be cut.

Generally soft materials will machine better with more clearance than tool steels, and the like. Usually, for cutters up to 4 in. in diameter, from 6 to 7° will be found ample on the outside diameter. Over and above this diameter, the angle may decrease, say ¼° for each 1 in. in diameter, until 4° is reached. The clearance on the teeth of end mills should be from 2 to 3°, when the cutters are used for roughing and finishing. If used for roughing alone, a little more clearance is better.

Serviceable Spring Bumper

An efficient and sturdy spring bumper can be made from a 12-in. section of old tire casing filled with a tightly rolled section of inner tube. This is strapped over the spring, as shown in the illustration. This style of bumper is usually adaptable to both rear and front springs, and should find favor with tourists, who frequently overload their cars with camping equipment, and encounter bad detours and rough roads. In the case of a broken spring, this bumper makes an excellent cushion between the axle and the frame, enabling the car to be driven home.



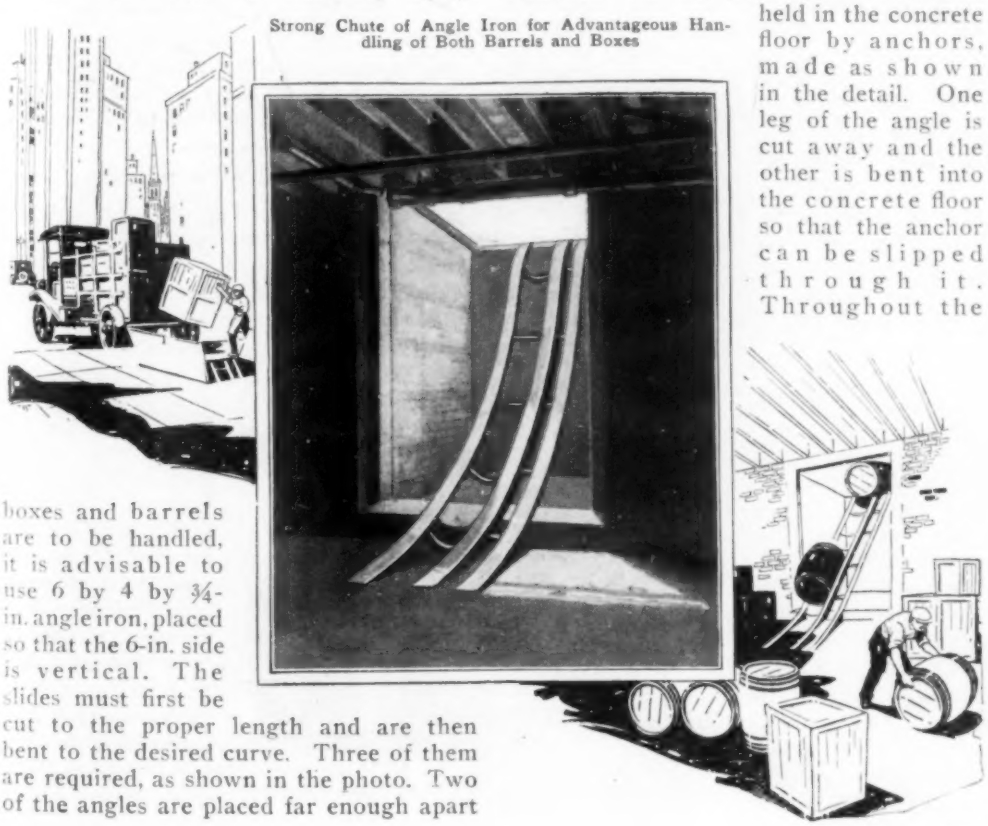
Old Tire Casing and Inner Tube Make Effective Bumper on Auto Spring

A Substantial "Built-In" Chute for Barrels and Boxes

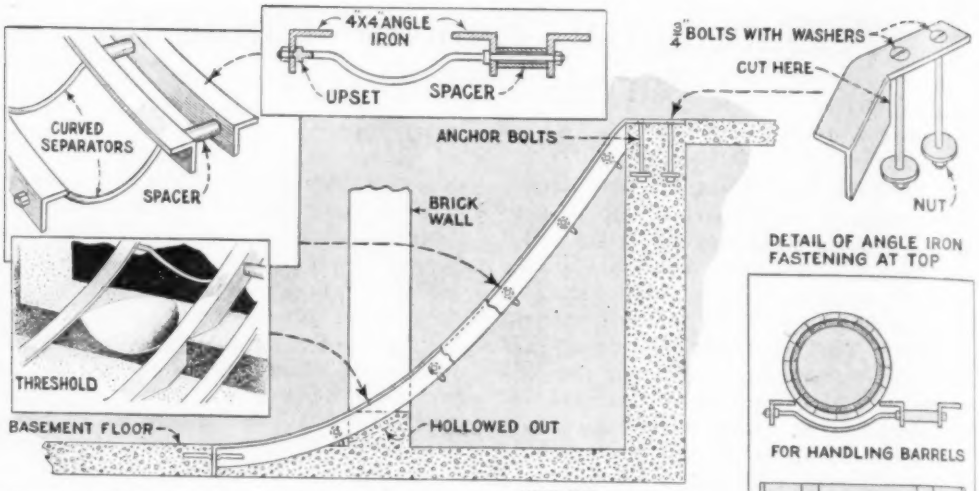
By ROY M. SINGER

A CHUTE that will handle both barrels and boxes with ease is exceptionally useful. All the necessary details for building such a combination chute are shown in the illustrations accompanying this article, enabling anyone to build it without trouble. The particular feature of advantage of this type of chute is that the barrels can be controlled so that they will not slide off the chute on the way down. The slides are made of angle iron such as can be obtained at almost any place where structural iron is available. It is quite possible that secondhand pieces of suitable size can be picked up in a junk yard. The proper size of angle iron to use is 4 by 4 by ½ in., the length of the slides, of course, depending on the particular installation. If extremely heavy boxes and barrels are to be handled, it is advisable to use 6 by 4 by ¾-in. angle iron, placed so that the 6-in. side is vertical. The slides must first be cut to the proper length and are then bent to the desired curve. Three of them are required, as shown in the photo. Two of the angles are placed far enough apart so that a barrel will slide easily between them, and the third is placed so that the chute will have sufficient width of bearing for the largest box it is expected to handle.

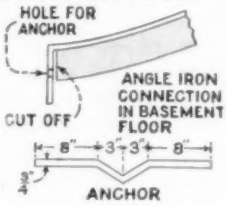
The method of anchoring the slides at the top and bottom is important, for upon this depends the stability of the entire installation. The leg at the top should be flush with the surface of the concrete, and the bottom leg should be imbedded in the concrete floor, as indicated in the details. At the top, the slides are held with anchor bolts fixed in the concrete, the heads of the bolts being set in countersunk holes in the slides, so that these heads will not interfere with boxes and barrels sliding over the surface. Flat washers, 4 by 4 by ½ in., are used to set the bolts in the concrete. At the bottom, the slides are held in the concrete floor by anchors, made as shown in the detail. One leg of the angle is cut away and the other is bent into the concrete floor so that the anchor can be slipped through it. Throughout the



Strong Chute of Angle Iron for Advantageous Handling of Both Barrels and Boxes



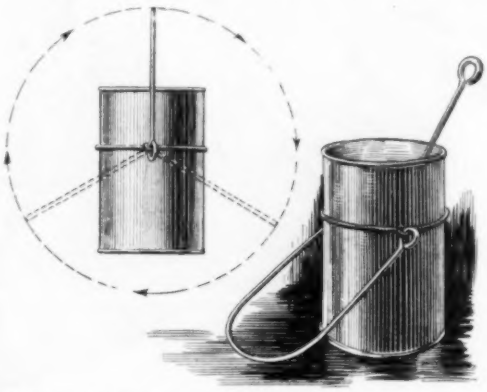
Constructional Details of the Chute, Showing Method of Anchoring and Supporting the Slides



length of the chute, the slides are kept apart by separators, placed at intervals of about 3 ft. The separators are curved between the two left-hand slides, so that they will not offer any obstruction to the barrels sliding down the chute. In case the chute is carried past a threshold, as in the case shown in the illustrations, the threshold should be cut out so that the barrels will not hit it. The separators are made as follows: A length of 1-in. iron rod is cut into proper lengths. Each of these is bent to the shape shown, and collars are welded on in the positions indicated in the detail. Each separator is threaded on both ends and short pieces of pipe are cut to a length equal to the distance between the two right-hand slides. The pieces of pipe are held between the two slides and the separators are slipped through. If the collars have been correctly placed, there will be just room enough for a nut to be screwed on each end. The slides are held so that they cannot work away from each other, and the entire arrangement is considerably strengthened. If it is not desired to weld collars on the separators, the screw threads could be cut farther on the ends and inner nuts and washers used instead of collars.

Detachable Can Handle

Welding flux used by one shop comes in large cans without handles. The cans must of necessity be carried around a good deal, and therefore the shop operator made a handle, which could be taken off or replaced quickly on a can. It is made of wire and stout cord, the former having looped ends through which the cord is threaded and knotted. To attach the handle, the looped cord is placed on the can, and the handle is wound around to twist the cord until it is tight enough to hold the can. Once this is done the handle will not come off, as the can



Quickly Improvised Bail on Large Cans Facilitates Carrying Them

is always either resting on the bottom, as shown in the drawing, or carried by the handle. The twisted cord tends to unwind itself, and as soon as the can is set down, the handle snaps back out of the way. When the contents of the can have been used up enough to decrease its weight, the handle is unwound a turn or so to make the can hang straight.

Bleaching Linseed Oil

If it is desired to bleach linseed oil for some special purpose, mix it with some five per cent of peroxide of hydrogen in a tin or glass vessel and shake it from time to time. It will require only a few days to bleach the oil, which then may be poured off, the peroxide having been reduced to oxide of hydrogen—water. There are other ways of bleaching linseed oil but they require about a month in making the change, and this is the simplest and quickest method.—A. A. Kelly, Frazer, Pa.

Armature Winders' Hammer

Armature winders, and other mechanics who work on electrical machinery, often need to force wires into their slots by tapping them down with a hammer. To do this without damaging the insulation requires considerable skill, unless a hammer having a resilient face is used. An ordinary mechanics' hammer can be provided with a resilient face by wrapping friction tape over it, as shown in the illustration. The tape is coiled into a tight roll equal to the diameter of the hammer head. It is then placed against the face and bound to it by a dozen layers tightly drawn over both the hammer head and the extending roll. This will provide effective cushioning for the blow and protect the insulation from damage.—Eugene Emerson, Brooklyn, N. Y.

Locking the Steering Wheels on Trucks Used in Factory

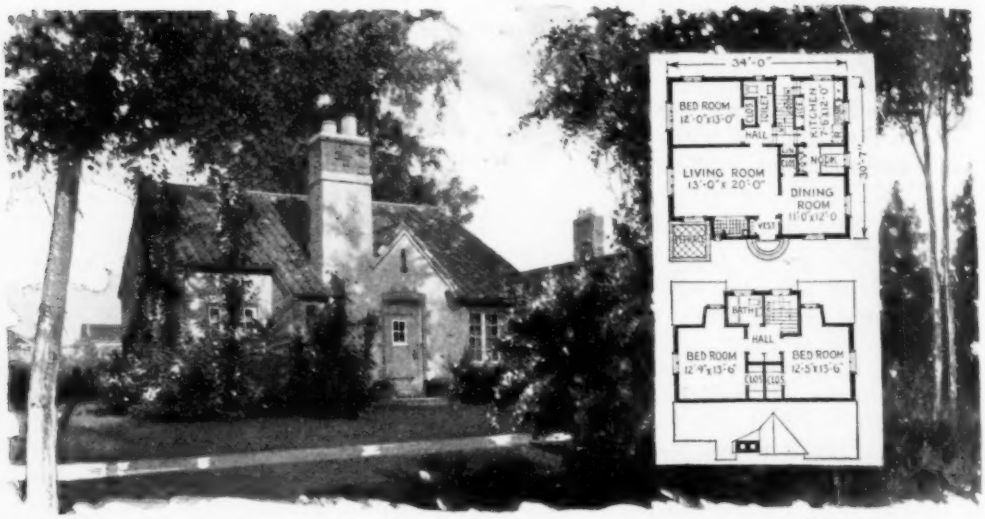
It is often necessary to back a factory truck a considerable distance down an alley having very little clearance, and this is an awkward task, as it is difficult to back it up in a straight line. By fixing a simple lock on the truck, we overcame this difficulty. The lock consists of a piece of strap iron, bent double and fixed to the top and bottom of the truck floor in the center. It is slotted to receive the truck handle. When the truck has to be backed any distance, we first set the rear wheels straight, then push the handle back into the slot to lock the front wheels.—Harry Moore, Montreal, Can.

Sheet-Metal Device on Factory Truck Locks the Steering Wheels

Floor Heater for a Small Shop

The brick floor in my shop is very cold in winter, and to make it more comfortable, I removed the brick and dug a hole, 36 in. long, 18 in. wide and 18 in. deep, in front of the lathe where I stood most of the time. An old two-burner oil stove was procured and set in the hole. I then covered the hole with a board, made to fit tightly, and bored a number of ½-in. holes near the center. A large hole was also cut at each side for draft. I was surprised at the results of this little heater. —J. H. Priestly, Lawrence, Mass.

Is This Your Home?



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WHAT sort of result issues from the architect's alchemy? He mixes together walls, roofs, windows, chimney stacks in his paper crucible. From it must come order, direction, beauty. The more skillful he is the more beauty he gets. Here then, in this plan, is an expression of the alchemy of architecture by which gross materials have been transmuted into pure beauty—in a word, into architecture.

To this six-room house, four on the first floor and two on the second, have been added vestibule, breakfast room, terrace, inglenook with gorgeous fireplace, and closets in profusion.

Going over the plans we find many details of interest. For example, there is a first-story bedroom and toilet, a grade entrance, coat closet in the vestibule and three linen closets.

The living and dining room, and the kitchen, occupy a position which is detached from the first-story bedroom. The separation of kitchen and dining room by the breakfast alcove is an arrangement which has its particular advantage.

The placement of the dining alcove makes of this feature, which has come to be the standard equipment of the small house, a somewhat more formal affair than the usual dining space that appears as part of the kitchen proper. Yet its convenience is practically as great.

The interesting details are not confined to the plan alone. Perhaps the prospective home builder is more inclined to give the exterior most of his attention.

There is a contrast of materials here which lend vivacity from color and texture as well—plastered walls, variegated tile roof, brick insets about the doorway, iron-bound door. The bricks at the stoop and at the chimney stack, complete a variety which is wholly bounded by good taste.

Construction: Hollow tile walls, exterior finish stucco, brick trim; window frames may be of metal if desired; lot size, forty-five feet; face, east or south.

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Entered as Second Class Matter at the Post Office Department, Canada.

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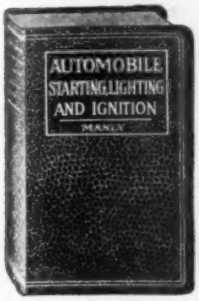

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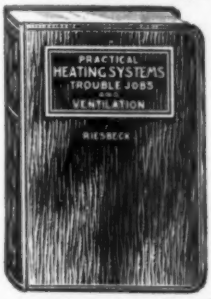

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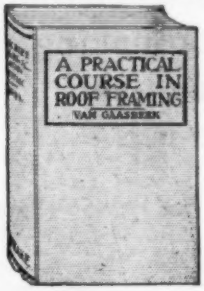

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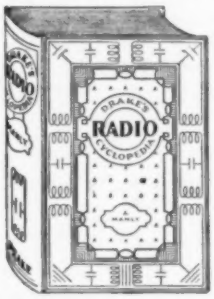

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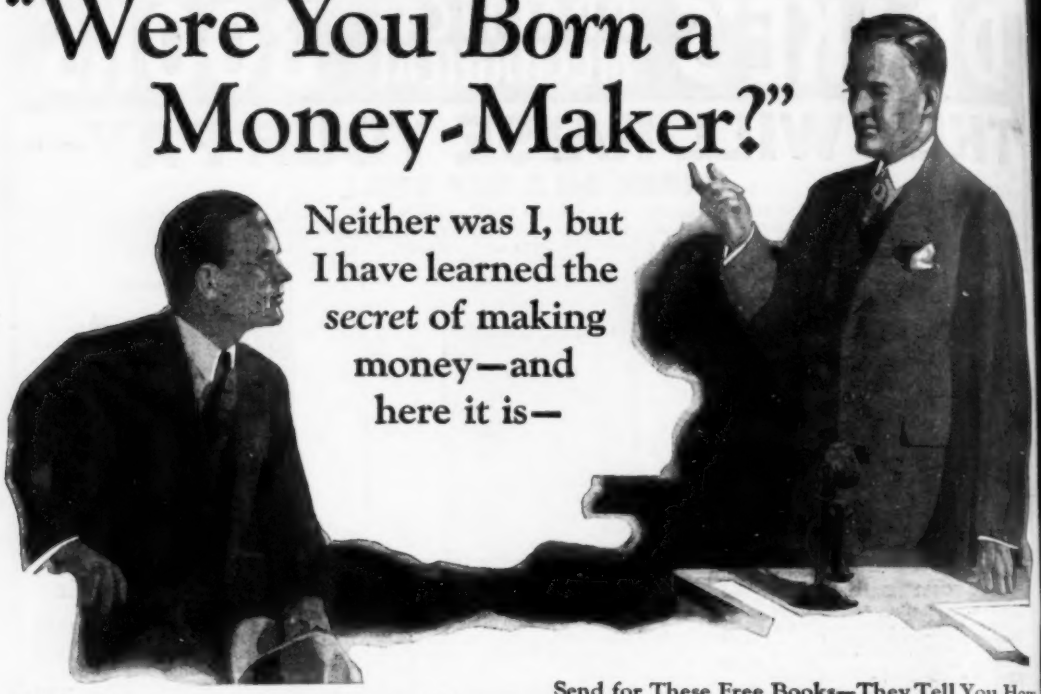

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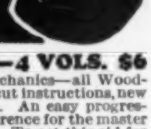

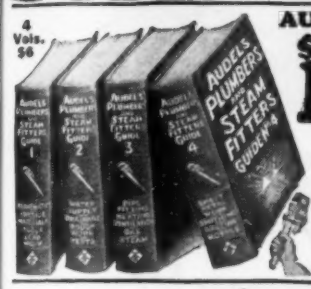

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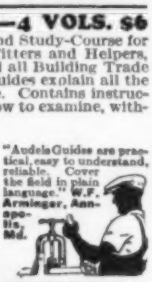

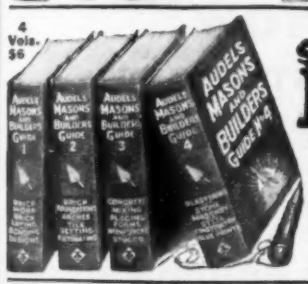

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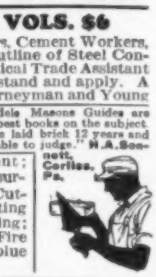

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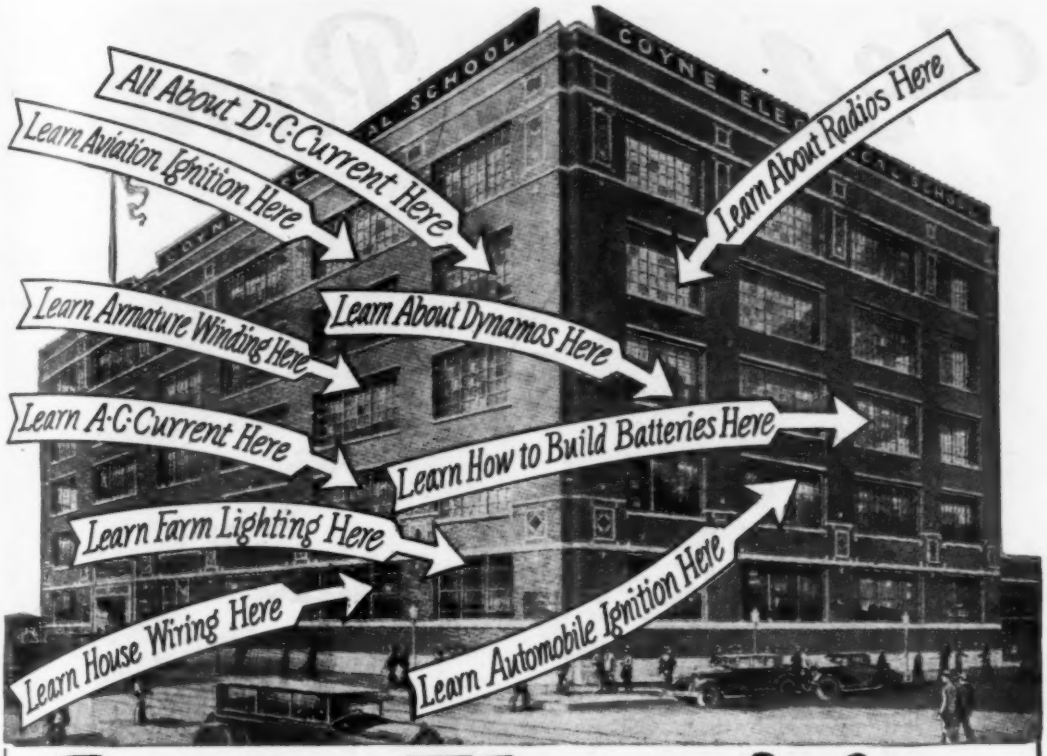

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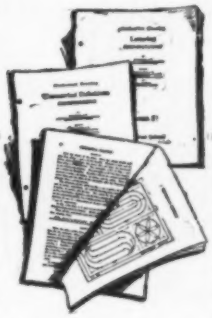

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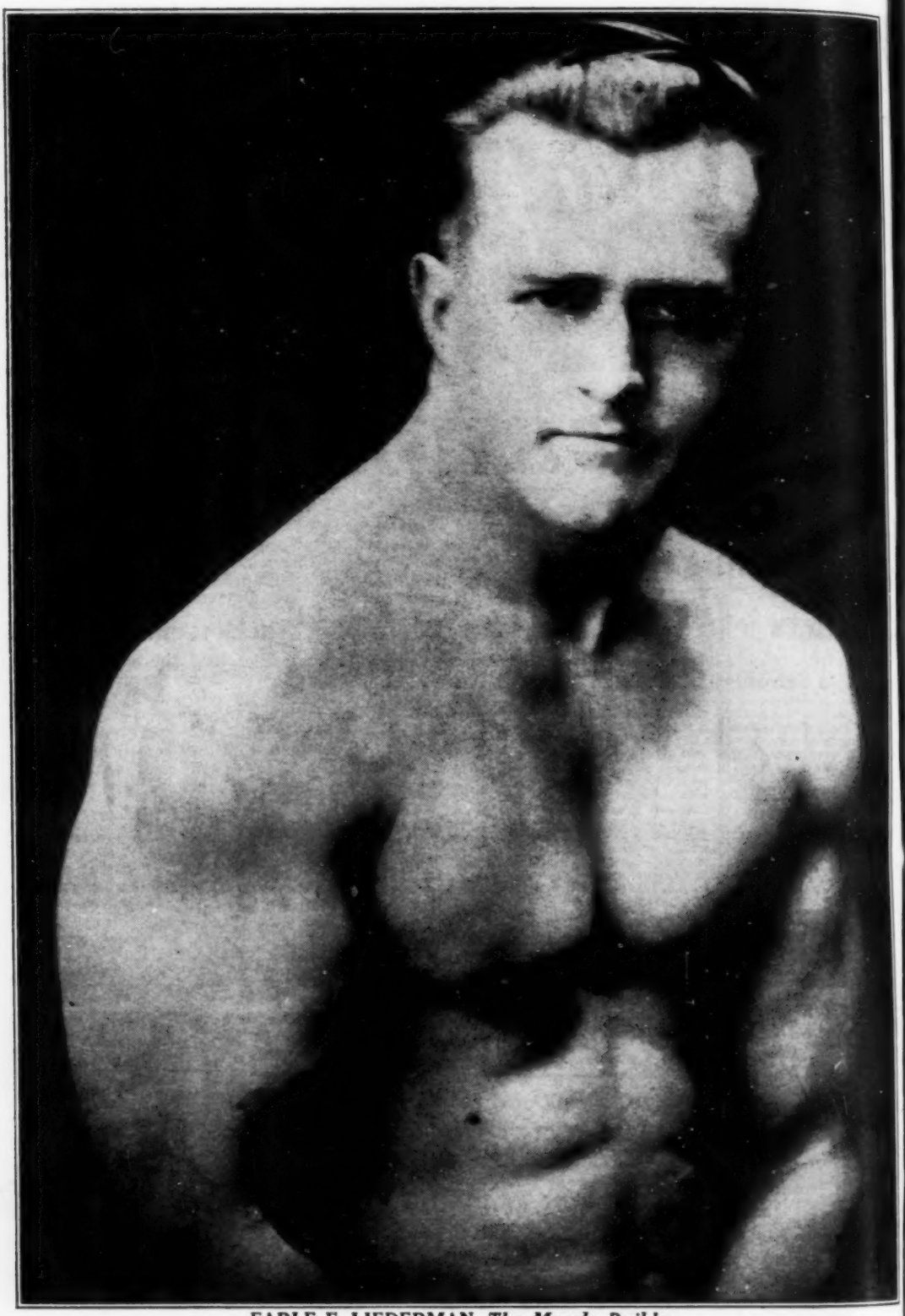

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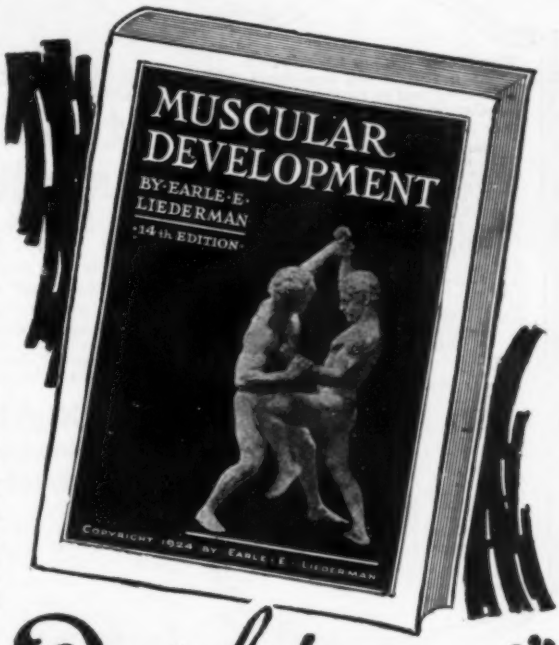
and I offered something that would give you ten years more to live, would you take it? You'd grab it. Well, fellows, I've got it, but don't wait till you're dying or it won't do you a bit of good. It will then be too late. Right now is the time. Tomorrow or any day, some disease will get you and if you have not equipped yourself to fight it off, you're gone. I don't claim to cure disease. I am not a medical doctor, but I'll put you in such condition that the doctor will starve to death waiting for you to take sick. Can you imagine a mosquito trying to bite a brick wall? A fine chance.

A RE-BUILT MAN

I like to get the weak ones. I delight in getting hold of a man who has been turned down as hopeless by others. It's easy enough to finish a task that's more than half done. But give me the weak, sickly chap and watch him grow stronger. That's what I like. It's fun to me because I know I can do it and I like to give the other fellow the laugh. I don't just give you a veneer of muscle that looks good to others. I work on you both inside and out. I not only put big, massive arms and legs on you, but I build up those inner muscles that surround your vital organs. The kind that give you real pep and energy, the kind that fire you with ambition and the courage to tackle anything set before you.



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A Real Man

When I'm through with you you're a real man. The kind that can prove it. You will be able to do things you had thought impossible. And the beauty of it is you keep on going. Your deep, full chest breathes in rich, pure air, stimulating your blood and making you just bubble over with vim and vitality. Your huge square shoulders and your massive muscular arms have that craving for the exercise of a regular he-man. You have the flash to your eye and the pep to your step that will make you admired and sought after in both the business and social world.

This is no idle prattle, fellows. If you doubt me, make me prove it. Go ahead, I like it. I have already done this for thousands of others and my records are unchallenged. What I have done for them, I will do for you. Come then, for time flies and every day counts. Let this very day be the beginning of new life for you.

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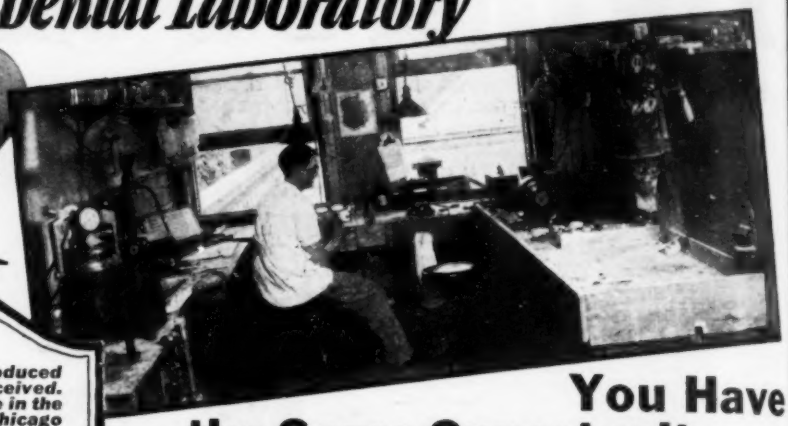

The following is reproduced from a letter we received. The original is on file in the McCarrie School in Chicago

Dear Mr. McCarrie:

I was bookkeeping up until January, 1924, at $1500 per year, and while having lunch one noon, I picked up a "Popular Mechanics" and ran across your ad, which fascinated me very much. Although making a good living at the time, I was not entirely satisfied, so I wrote for your literature.

Upon receipt of the above, and having read it very thoroughly, I could not help but admit I was quite enthused. Two weeks later I arrived at your school. Completing the course in August, I returned home where I received a position in a laboratory. After a few months experience, I got connected with Dr. L..... with whom I stayed two years, resigning my position to open a laboratory of my own, October 15, 1926. I have ten dentists on my list which net me about $150.00 of business per week, with business increasing rapidly.

Thanking you hardly expresses my appreciation of your most thorough course. Your promises were more than fulfilled, and in closing I want to state that there is a large field open for your graduates. I remain,

A Successful McCarrie Graduate.

(Signed)
William H. Clayton.

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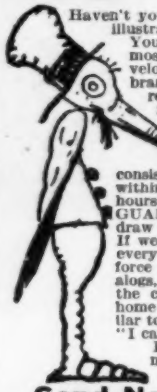

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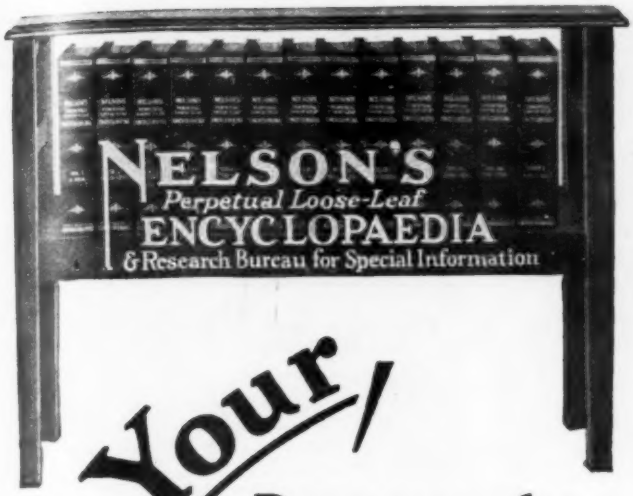

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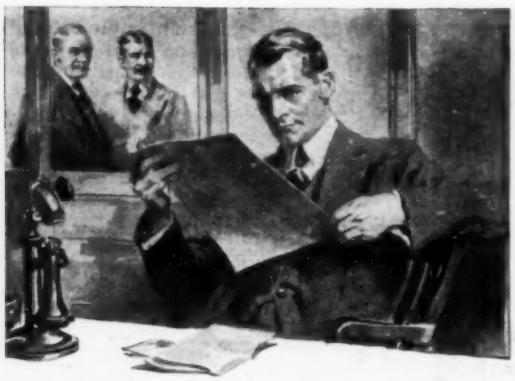

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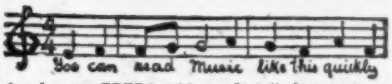

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- How to become a clear, accurate thinker
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- How to be the master of any situation

Three months previously, the forces of indecision, timidity, and inability to talk in public would have held me to my seat. But suddenly that new power took possession of me and drove me to my feet. That wonderful 20-minute daily training at home had taught me to forget myself and think only of my subject. Almost automatically the ideas which had heretofore lain dormant in a mental jumble, now issued with a vigor, clearness and enthusiasm that astounded me no less than my boss and associates. And I noticed with silent exultation the rapt, intent look on my audience as my story unfolded itself smoothly and eloquently.

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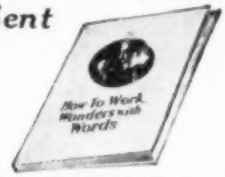

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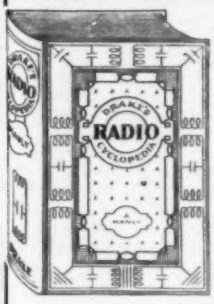

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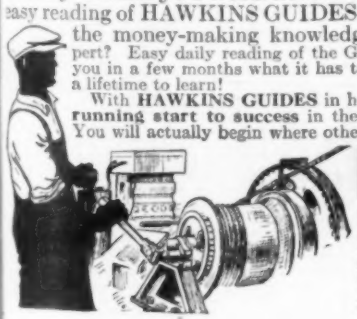

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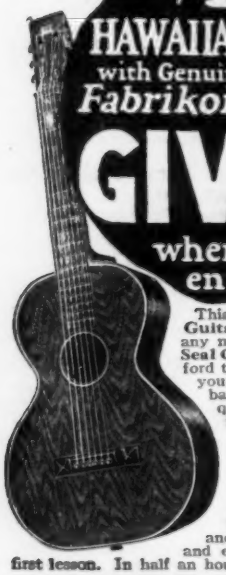

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I NEVER was much of a dancer. But when our club gave this affair I couldn't stay away. Even now, I should have been sitting safely on the "sidelines"—if the fellows hadn't made that sarcastic remark.

"Show them you can do it! Show them you can dance as well as they!" my pride whispered. And I would!

But halfway across the hall my courage died. I was nearly paralyzed with fright. There she was, waiting expectantly—Marion Blake, an exquisite dancer—graceful, poised, at ease. Suppose she should refuse? Suppose she should leave me in the center of the floor? Oh, wouldn't the fellows chuckle then!

The Unexpected Happens

"I'm—I'm sorry"—I stammered. "I guess——"

"Why, of course, I'll be glad to dance!" she interrupted. And before I realized it we were swallowed up in the dancing throng.

What a terrible ordeal it was for me! And twice as bad for her. I stumbled through the steps. I trod on her toes. I tried desperately to keep in time with the music. Yes, my dancing was inexcusable—hopelessly out-of-date!

Suddenly she suggested that we sit out the rest of the number. I blushed furiously "Now, it's coming!" I thought. "Now, she is going to tell me what she thinks of my nerve!"

But I was in for the surprise of my life. "Jim," she began softly. "I'll be frank. You're not the best dancer in the world. But you're certainly not the worst. What you need is 'brushing up' on the latest steps. Why don't you get in touch with Arthur Murray?"

"Arthur Murray! Arthur Murray!" I repeated. "He teaches dancing by mail. You can't learn that way!"

"No?" and Marion arched her eyebrows. "The truth is, that's *exactly* the way I learned—even though no one *does* suspect it!"

Naturally I was astounded, but the next evening I found one of Arthur Murray's ads and clipped the coupon. Then I mailed it, asking for his free booklet and five free lessons. If Marion could become a wonderful dancer that way it was certainly worth investigation—especially since I didn't risk a penny.

But halfway across the hall my courage died. I was nearly paralyzed with fright. There she was, waiting expectantly—Marion Blake, an exquisite dancer—graceful, poised, at ease. Suppose she should refuse? Suppose she should leave me in the center of the floor?

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A week later I attended a dance. The old crowd was there. "Here he is again!" they chorused. "Give him the cigars! He earned them!" Imagine how surprised they were when I asked Marion to dance! They stood open-mouthed as I glided around the floor like an expert! Now girls are always delighted to dance with me. I laugh when I think how scared I was that terrible evening—for everywhere I go I am welcomed as an accomplished dancer!

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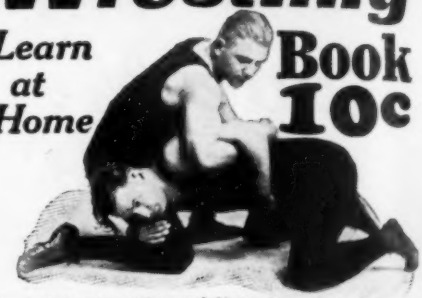

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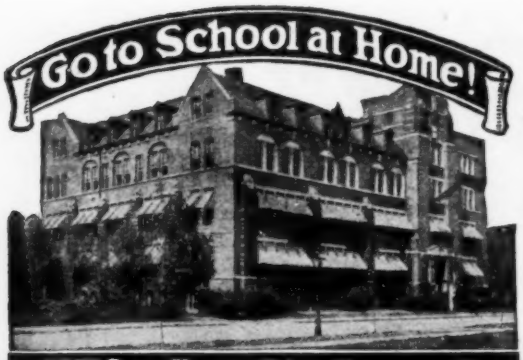

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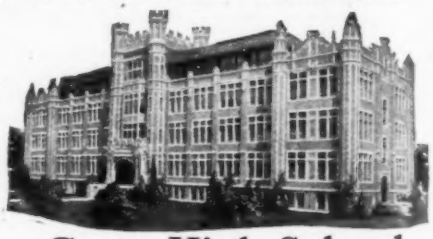

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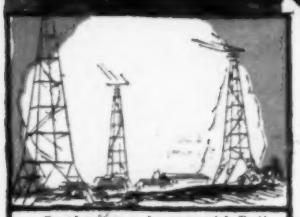

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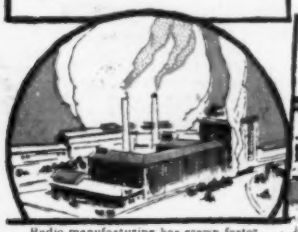

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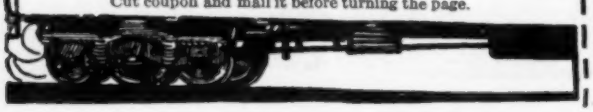
Cut coupon and mail it before turning the page.



MEN—BOYS 18 to 45

Use Coupon Before You Lose It

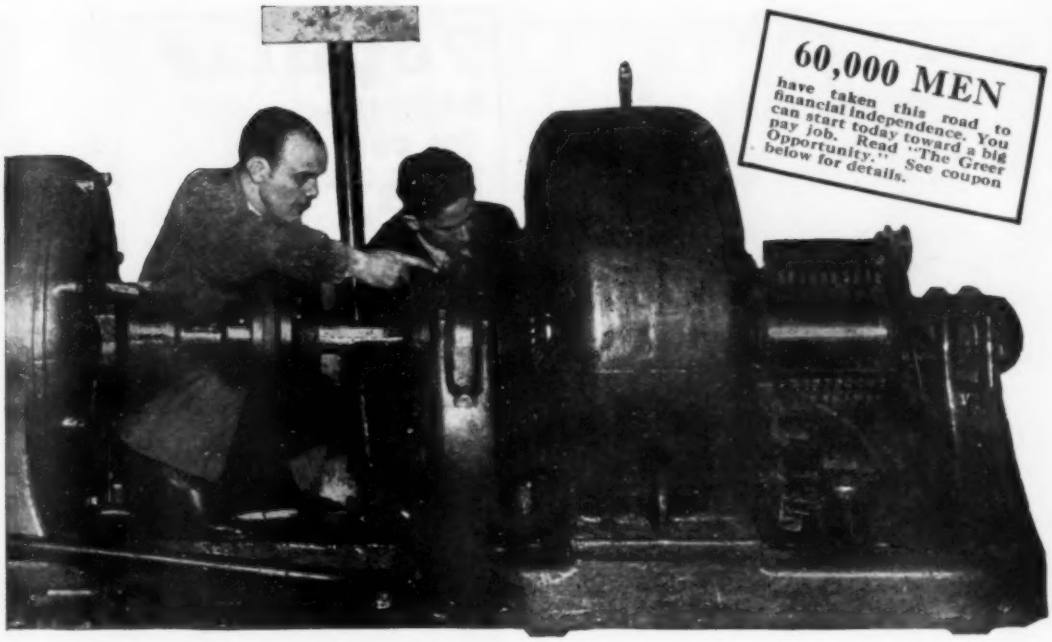
COUPON

FRANKLIN INSTITUTE, Dept. P175, Rochester, N. Y.
Rush to me, entirely free of charge, (1) A full description of the position checked below; (2) 32-page book, with list of positions obtainable; (3) Particulars telling how to get the position checked.

☐ Railway Postal Clerk ($1900 to $2700) ☐ Customs Positions ($1140 to $1860)
☐ Postoffice Clerk ($1700 to $2300) ☐ Prohibition Agent ($1800 to $3000)
☐ City Mail Carrier ($1700 to $2100) ☐ Rural Mail Carrier ($2100 to $3300)

Name .....

Address .....



"I was a $30 a week clerk —but electricity now pays me $10,000.00 per year"

That's what happened when I stepped out for a big-pay job—Greer paid my fare to Chicago

What this man did you can do. Five years ago he clipped a coupon like that on this ad. He didn't have much money. He was slave to a clerical job that paid starvation wages.

I paid his way to Chicago. When he got here I got him a part time job and found him a place to live.

In my shops he learned by actually working on motors, dynamometers—all the costly equipment I've gathered. My friendly instructors guided his work until he knew more than many highly paid electricians. Now he's independent—connected with a big company, drawing big pay.

Like Electricity?

—*Make it Pay You Big Income*

If you like to fool with the "juice" that runs our industries you can get into this big pay class. I've trained over 60,000 others. I'll turn you out fit for the work big corporations need high paid men to do. They are **searching** for these men. Those from Greer College, because they've learned by actual experience on the newest equipment, pick the desirable positions.

There isn't room here for further details, but send for my book, "The Greer Opportunity." It tells full facts about the course, how I get you a part time job, find you a place to live—and even pay your fare to Chicago.

Take Automobile Course

at Same Time

By learning automobile—another big opportunity—at the same time you save considerable money. Or you can learn Electricity only. Just which to go into you will know better when you have all the facts.

Act Promptly

To get anywhere in life you have to **act.** Don't put off sending for "The Greer Opportunity." It costs nothing.

Write your name and address on the coupon, and mail it direct to me. Then see just what you will learn—look over the photos of the Greer shops—study the facts about both Electrical and Automobile courses.

Do this at once. It is time to enroll now. Mail coupon today.

GREER COLLEGE OF ELECTRICAL ENGINEERING

Dept. 1201 • 2024 S. Wabash Ave. • Chicago

ERWIN GREER, President, Greer College,
Dept. 1201 2024 S. Wabash Ave., CHICAGO.

Please send me your FREE BOOK and offer for ☐ Electrical ☐ Automotive course
It is understood I am not obligated in any way

Name .....

Address .....

LICKED!

YES, licked! Twenty-five years old and still working in a small job at a small salary.

Why? Well, chiefly because he felt he didn't need special training. And now that he realizes the need, he still keeps putting it off — and off — and off. He'd rather shoot pool or stand around the corner than spend an hour each night in money-making spare-time study.

And the pity of it is that he has just as much natural ability as most of the men who have gone ahead of him. He could be earning three times his present salary if he only had special training.

Are you like that? Are you going to work for a small salary all your life? Or are you going to get the special training that employers everywhere are looking for? It is for you to decide.

Nobody can force you to mail this coupon to the International Correspondence Schools. That's a matter entirely in your own hands. But remember this —the sooner you send it in, the sooner you are going to get a better job and a better salary.

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The Universal University"
Box 5688-E, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, **"Who Wins and Why,"** and full particulars about the course before which I have marked X in the list below:

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Industrial Management
- ☐ Personnel Organization
- ☐ Traffic Management
- ☐ Business Law
- ☐ Banking and Finance Management
- ☐ Accountancy (including C.P.A.)
- ☐ Nicholson Cost Accounting
- ☐ Bookkeeping
- ☐ Private Secretary
- ☐ Spanish ☐ French
- ☐ Salesmanship
- ☐ Advertising
- ☐ Better Letters
- ☐ Show Card Lettering
- ☐ Stenography and Typing
- ☐ English
- ☐ Civil Service
- ☐ Railway Mail Clerk
- ☐ Common School Subjects
- ☐ High School Subjects
- ☐ Illustrating ☐ Cartooning

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Electrical Engineering
- ☐ Electric Lighting
- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Railroad Positions
- ☐ Gas Engine Operating
- ☐ Civil Engineer
- ☐ Surveying and Mapping
- ☐ Metallurgy ☐ Mining
- ☐ Steam Engineering
- ☐ Architect
- ☐ Architects' Blueprints
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ Chemistry ☐ Pharmacy
- ☐ Automobile Work
- ☐ Airplane Engines
- ☐ Agriculture ☐ Navigation
- ☐ Mathematics ☐ Radio

Name.....

Street Address.....

City..... State.....

Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

Popular because he can Play and earn $75.00 to $200.00 each week

LEARN AT HOME

With a nationally famous artist as your teacher you can learn to play classical or popular music. We guarantee our personal teaching method. Both advanced and elementary courses on *all* instruments.

Write for catalogue

CONN NATIONAL SCHOOL of MUSIC INC.
506 So. WABASH AVE., DEPT. 516 CHICAGO

LAW

STUDY AT HOME

Become a lawyer. Legally trained men win high positions and big success in business and public life. Be independent. Greater opportunities now than ever before. Big corporations are headed by men with legal training. Earn

$5,000 to $10,000 Annually

We guide you step by step. You can train at home during spare time. Degree of LL.B. conferred. LaSalle students found among practicing attorneys of every state. We furnish all text material, including fourteen-volume Law Library. Low cost, easy terms. Get our valuable 108-page "Law Guide" and "Evidence" books FREE. Send for them NOW.

LaSalle Extension University, Dept 1264-L Chicago
The World's Largest Business Training Institution

Learn Watchwork, Jewelrywork and Engraving A fine trade commanding a good salary, and your services always in demand. Address **Horological,** Dept. P, Bradley Institute, PEORIA, ILLINOIS, for our latest catalog.

Big Money in Poultry

Eggs Turn into Dollars FAST!

Make $1,000 a Year in Spare Time—Easy

Lots of room for YOU in the poultry business. 85% of the people of this country live in cities. EVERYBODY eats eggs and poultry meat—but only 15% produce them. Why not let the "other fellow" pay YOU the fancy prices? Easy to get started in back yard, on vacant lot, or farm. We GUARANTEE success if you follow our methods. We show you how to feed for eggs, in winter, when eggs are high in price; how to cut feed bills; how to keep flocks healthy; how to tell laying hens, PAY-BIRDS, from loafers. Our course, produced by eighteen famous experts, endorsed by 30 leading agricultural schools, gives you thousands of sure, proved, tested Methods that make PROFITS CERTAIN. FREE book tells what we're doing for others—and what we can do for you.

Others Say:

"You have opened up to me a pleasant and profitable way of gaining an independent living."
Seldon Anderson, R. I.

"When I enrolled for your course, I knew nothing about poultry keeping. I am now successfully operating a commercial poultry farm."
W. J. Warthen, Conn.

"Your course was a splendid investment. I recommend it for both beginners and experienced poultrymen."
Y. W. Ow, Hawaii

Mail Coupon Today

Mail this now

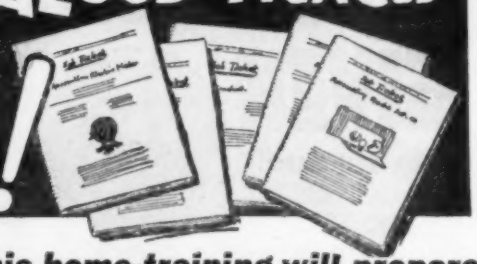
The National Poultry Institute
Washington, D. C. Dept. 411-D

I am interested in your plan on **"How to Raise Poultry for Profit."** Send me your FREE book, without obligation on my part.

Name.....

Address.....

5 ELECTRICAL Job Tickets actually FREE!



to prove this home-training will prepare you for a good job and a raise in pay!

Get these five job-tickets. Look them over. Test your own ability to master Electricity at home in spare time. See for yourself how every fact has been simplified. See what thousands of men have paid millions of dollars for, to help them earn BIGGER PAY. Uncover some of the mysteries of Electricity, and see why millions of men are so fascinated by it. Don't send a penny, don't enroll—just mail the coupon.

Training Built by 29 Noted Engineers

This is not a one-man, one-idea school. 29 famous Engineers and Executives of the following corporations and universities helped me make Dunlap-training complete and up-to-date.

1. General Electric Co.
2. Commonwealth Edison
3. Crocker-Wheeler Co.
4. Cutler-Hammer
5. American Tel. & Tel. Co.
6. Westingh. El. & Mfg. Co.
7. Western Electric Co.
8. Underwriters Lab., Inc.
9. Columbia University
10. Dartmouth College
11. Massachusetts Inst.
12. Lehigh University
13. University of Vermont

AND MANY OTHERS

Go Into ELECTRICITY!

Thousands of jobs open at $60 to $125 a week. My training prepares you to fill them. Superintendents of Power Plants Wanted. Chief Electricians Wanted. Electrical Experts Wanted in Radio, Electrical factories, Auto Plants, Telephone and Telegraph Systems, etc.

I Will make this Contract with You!

Read it. This million dollar institution stands back of this agreement to PREPARE you to fill a well-paid Electrical Job, and then to help you FIND the job—or to refund the small amount charged for your training!

7 Costly Electrical Outfits Given!

$10 Motor Given

I send you absolutely without extra cost, as a part of this training, 7 costly outfits of standard size tools and materials, so you learn Electricity BY DOING actual Electrical jobs. One of these outfits is a $10 Electric Motor—a real motor and generator, the same type as the big fellows in a power plant. I send it to you "knockdown" and have you wind the field and armature and assemble it. *That's the way I teach every branch of Electricity!* House-wiring, Electric Light, Radio, and Motor outfits included.

Free Job Service!

for STUDENTS and GRADUATES. This **JOB SERVICE** keeps in touch with great Electrical employers all over America. The day you enroll, this Job-Service Department registers you, finds out what kind of job you want, where you want to work, etc. And when you apply for the job you want, we back you with our recommendation and help you make good in it after you get it.

WRITE Me Immediately!

If you have reached the point where you realize YOU MUST train and specialize to get anywhere, *write me immediately!* I will show you the wonderful opportunities, the enormous salaries, the many openings waiting in this billion dollar industry. I'll tell you about our sensational combination TRAINING-AND-JOB offer which practically assures your success. Mail coupon and get 5 Free Electrical Job-Tickets and complete information.

CHIEF ENGINEER DUNLAP, *Electrical Division*

AMERICAN SCHOOL Drexel Avenue and 58th Street Dept. E-974 CHICAGO

5 Job Tickets actually FREE!

Chief Engineer Dunlap, Electrical Division
AMERICAN SCHOOL
Drexel Ave. & 58th St., Dept. E-974 CHICAGO

Send me your combination TRAINING-AND-JOB offer, 5 Free Job-Tickets, facts about opportunities in Electricity, etc.

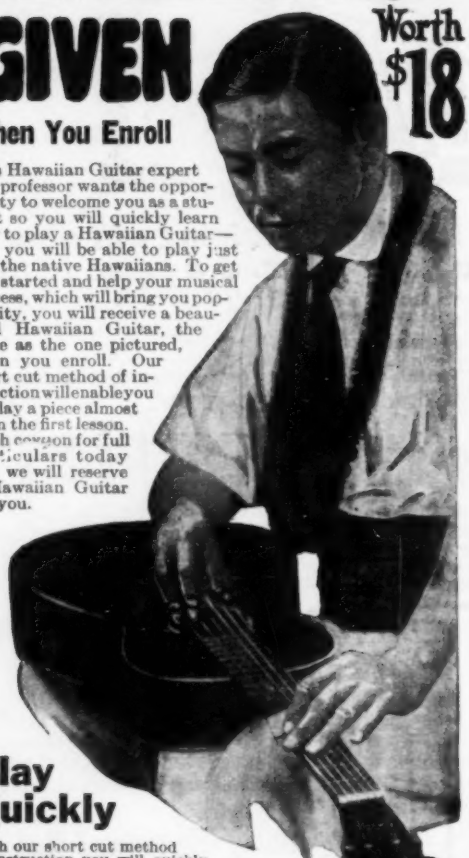
Name _____

Address _____

Occupation _____ *Age* _____

Hawaiian Guitar GIVEN Worth $18

When You Enroll



This Hawaiian Guitar expert and professor wants the opportunity to welcome you as a student so you will quickly learn how to play a Hawaiian Guitar—yes, you will be able to play just like the native Hawaiians. To get you started and help your musical success, which will bring you popularity, you will receive a beautiful Hawaiian Guitar, the same as the one pictured, when you enroll. Our short cut method of instruction will enable you to play a piece almost from the first lesson. Rush coupon for full particulars today and we will reserve a Hawaiian Guitar for you.

Play Quickly

With our short cut method of instruction you will quickly learn how to play Hawaiian Guitar, which will bring you popularity and social success. You will learn to play from notes. If you never had any musical training, you will quickly get on, because our nine experts have perfected a course of home instruction which is as simple as learning A, B, C's.

Picture and Photograph Record Method Easy

We don't depend upon printed lessons only for your success, but we also furnish pictures of our professors playing, diagrams, charts and phonograph records for each lesson. This practically brings our professors from our studio to your own home and enables you to listen to their playing just as if they were actually in front of you. To prove this is easy, we will send you your first lesson free. Rush coupon now.

HAWAIIAN STUDIO No. 5212
of New York Academy of Music
100 Fifth Avenue, New York, N. Y.

Please rush your Free book, "How to Learn Hawaiian Guitar," and my first free lesson. Also reserve a Hawaiian Guitar for me. This obligates me in no way whatever.

Name.....

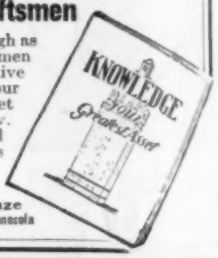
Address.....

City.....State.....

You can get a promotion like this

"Due to the training I received from your course, I have been promoted from the shop to the drafting room. I have completed only 11 lessons but have been able to satisfactorily draw up all the jobs I have been given." (Name on request.)

Ornamental Iron Draftsmen



Get Big Pay! Beginners as high as $60.00 a week — experienced men up to $500 a month in executive positions. Learn while on your present job. We'll help you get a position as soon as you qualify. **Write for free book** telling all about the opportunities in this line.

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1,000 Hotel Positions Open!

HOTELS, restaurants, clubs, apartments, hospitals, institutions, schools and colleges everywhere need trained men and women. Over 70,000 high-class positions paying $2,500 to $10,000 a year open annually in the hotels of the United States. Nearly one and three-quarter billions of dollars' worth of NEW HOTELS, CLUBS AND INSTITUTIONS being built this year will need over 200,000 trained men and women. Hotels start you at salaries up to $3,500 a year, with living usually included. At any time there are over 1,000 hotel positions open.

Previous Experience Unnecessary

You can have one of these fascinating, big-pay positions. The Lewis Schools guarantee to give you the valuable knowledge that it has taken some of the most successful hotel men years to obtain. Age is no obstacle—young and old alike have equal chance for success. Past experience absolutely unnecessary. A common school education is all you need.

We train you in your spare time with the Lewis Simplified Study Plan and put you in touch with big opportunities. All of your training under the personal supervision of Clifford Lewis, Managing Consultant for over 225 hotels thruout the United States. Our students employed by leading hotels everywhere.

Send coupon today for Free Book, "*Your Big Opportunity*," showing how we can train you for one of these splendid positions and explaining our Money-Back Agreement.

FREE BOOK COUPON

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Room AO-385, Washington, D. C.

Send me without obligation the Free Book "Your Big Opportunity."

Name.....

Address.....

City.....State.....

Now he DRAW$ *the thing$ he want$*

LOOK at drawing No. 1 above. Then compare it with No. 2 and note the improvement Federal School training has made in the work of Art Nelson. Before he studied drawing with the Federal Schools, he worked as a surveyor's assistant at $18.00 a week. Today he has a fine position in the work he enjoys at $75.00 a week. He says, "The Federal Schools made this possible through their training and co-operation, as I had only average ability before enrolling as a student." Mr. Nelson is just one of hundreds of young people making good money because of Federal training.

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The Federal School of Illustrating has taught hundreds of successful students. That is because its methods of instruction are right. Over fifty famous artists such as Sid Smith, Neysa McMein, Clare Briggs, Charles Livingston Bull, Norman Rockwell and many others contribute exclusive lessons and drawings to the Federal Course. They tell you their methods in a clear understandable way. The subjects include illustrating, cartooning, lettering, poster designing, window card illustrating, etc. They are easy to learn the "Federal Way"—at home in your spare time.

Have Your Drawing Talent Tested

If you like to draw, you may have the free criticism and analysis of your work by sending for our free Vocational Test Chart. We will send with it our free book, "A Road to Bigger Things," which explains illustrating as a profession. Nelson got his start sending for it. This is your opportunity—grasp it. Fill out the coupon now.

Federal School of Illustrating

Federal School of Illustrating,
12137 Federal School Bldg., Minneapolis, Minn.
Please send your free book, "A Road to Bigger Things."

Name.....

Occupation.....Age.....

Address.....

From $1,800 to $10,000 in Four Years

Thanks to Higher Accountancy

"LaSalle training in Higher Accountancy has enabled me in four years to increase my business more than 500 per cent." So writes John H. Lansing, Public Accountant, Income Tax Specialist, and prominent citizen of Amsterdam, New York, who deliberately resigned as purchasing agent for a large carpet manufacturing company to start on his own as a Public Accountant.

Mr. Lansing was 43 when he enrolled with LaSalle, and at the time was earning from his newly adopted profession less than $2,000 a year.

Today, the firm of which he is head is auditing the books of 100 business houses, including 20 corporations; and his Income Tax Department has more than 500 clients. Each year his business shows a healthy increase.

"When you consider that the average bookkeeper does not receive over $40 a week," writes Mr. Lansing, "it is obvious that $10,000 a year has advantages well worth the consideration of any ambitious man or woman. I shall always be grateful to LaSalle for the help it has given me in building a greater income."

Send for This Book—It's Free

Do you appreciate what Accountancy means in the business world? Do you realize that it constitutes the indispensable foundation for success in any business undertaking? Would you seriously fit yourself for positions paying $3,000, $5,000, $10,000 a year and even better?

LaSalle has prepared a 64-page book entitled "Accountancy, the Profession that Pays." The information it contains is of very real and definite value. It will pay you well to read it. And—LaSalle will send it to you free.

Balance the two minutes that it takes to fill out the coupon against the rewards of a successful career—then clip and mail the coupon—NOW.

— — — *Find Yourself Thru LaSalle!* — — —

LA SALLE EXTENSION UNIVERSITY
The World's Largest Business Training Institution

Dept. 1264-HR **Chicago**

I would welcome details of your *salary-increasing plan,* together with copy of "Accountancy, the Profession that Pays," also a copy of "Ten Years' Promotion in One," all without obligation.

☐ **Higher Accountancy**
Training for positions as Auditor, Comptroller, Certified Public Accountant, Cost Accountant, etc.

Other LaSalle Opportunities
LaSalle opens the way to success in every important field of business. If more interested in one of the fields indicated below, check and mail now.

☐ Business Management
☐ Modern Salesmanship
☐ Traffic Management
☐ Railway Station Management
☐ Law—Degree of LL.B.
☐ Commercial Law
☐ Industrial Management
☐ Factory Management
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☐ Personnel Management
☐ Banking and Finance
☐ Modern Business Correspondence and Practice
☐ Expert Bookkeeping
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☐ Commercial Spanish
☐ Effective Speaking
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Name .....

Present Position .....

Address .....

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It will tell you how you can quickly and easily learn to play beautifully right in your home and in your spare time.

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Music will open wide the doors of social success—make you the center of popularity everywhere. You will be surprised and delighted to find how easily you can learn with the famous National Academy Method. 200,000 successful students. Low cost, easy terms.

Courses in Piano, Violin, Trumpet, Voice, Banjo, Tenor Banjo, Organ, Spanish Guitar, Hawaiian Guitar, Mandolin. ***Write Today.***

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Learn correct English with Sherwin Cody's new invention. No rules to memorize. Like a fascinating game. Spare-time study, 15 minutes each day, quickly gives you command of English. Send for free booklet "How to Speak and Write Masterly English." Write today.

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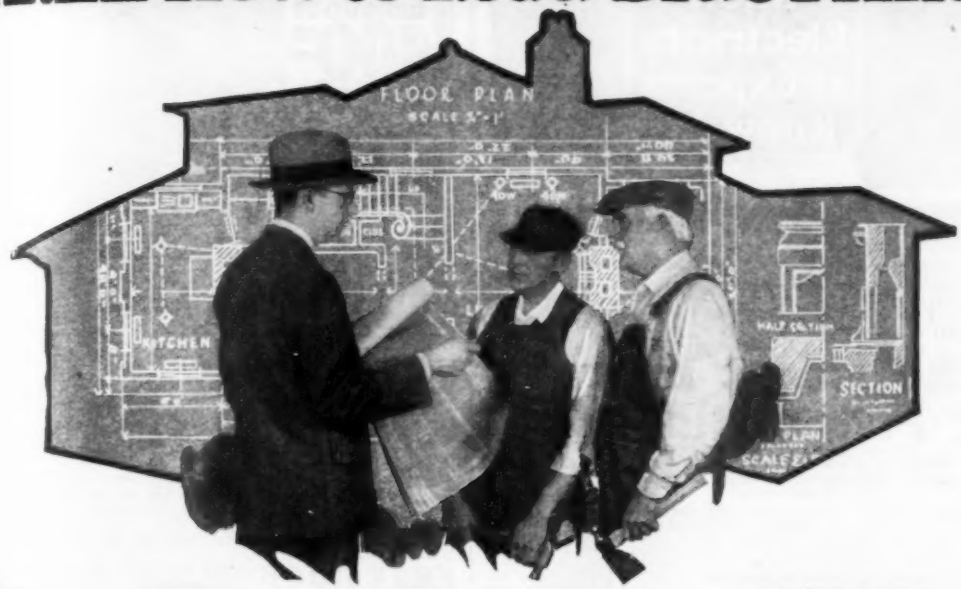
HARRY SCHWARTZBERG, PRES.
Dept. 265 American Radio Bldg., Kansas City, Mo.

FREE How to Read Blue Prints



New Easy Practical Way

Leads Quickly to $4,500 to $12,000 a Year

Thousands of Men From All Walks of Life Have Discovered an Altogether New Way to Double and Triple Their Incomes! Surprising, Yes—But True! Almost Over Night They Have Taken Their Choice of 9 Interesting, Big-Pay Jobs—Become Foremen, Superintendents, Estimators, Real Estate Experts—or Are Making Big Money in Business for Themselves. The Same Wonderful Opportunity Is Now Offered You. Don't Send One Penny. Just Mail the Coupon for Full Set of Valuable Blue-Print Plans, Big Free Book, and Complete Details.

BIG pay jobs by the score, yes, by the hundreds, are waiting for you in the world's richest industry—Building. There is a constant never-ending call for trained men—and still more trained men—men who have **practical** headwork training and can read Blue Prints and run jobs.

Many men think the only way they can get this practical "headwork" training is on the job. But thousands of Chicago Tech. graduates have proved that the idea is all wrong. In fact, a man can spend 5 or 10 years working with his tools and never get a real chance to learn the things he must know, if he is ever to get into the big-pay class. Anyhow, it's a long, hard, slow process—on the job.

READ!

"Since starting the Builders' Course I have been raised to Superintendent and my pay raised 100%."
P. F. Blair, Okla.

"I owe a lot of credit to your course. Am now listed as a Brick Contractor and made about $3,800 clear money this summer."
E. F. Baker, Ohio.

If You Live in or Near Chicago

Visit our day or evening classes which over 1,000 Builders attend. You can get the same training by mail—same Plans, Lessons and Instructors. Mail the coupon for details.

Amazing, New Kind of Training

But it's all different—the new Chicago Tech. Builders' Course way—amazingly different! It's quick, easy, certain. Right at home you get real Blue Prints used on actual jobs to examine and keep for reference. In language you can understand, as plain as A-B-C, everything is told you and worked out for you in concise, practical home lessons—no textbooks to study—you are taken by experts right through every step of Plan Reading, Estimating, and Superintendence so simply and easily it is just like play. You don't need even a grade school education to understand every word and absorb every fact.

Big Pay in 3 Months

Consider what this quick, practical Chicago Tech. training has done for others. Woodside, in less than three months, rises to foreman, then makes big money in contracting business for himself. In a few months McAvoy goes from bricklayer on the wall to foreman in charge at a big increase in pay. Marchand says, "Ten days after completing course my pay was raised 100%." Hundreds—yes thousands of others say the same. Chicago Tech. has helped them to bigger jobs or a business of their own. It is ready right now to help you.

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We want you to see for yourself how easily you can learn to read Blue Prints and do Estimating this new quick way—how easily you can double and triple your income. Test this yourself. Don't send one penny. Just mail the coupon. We will send you absolutely FREE a full set of practical, working Blue Prints, also valuable book, "How To Read Blue Prints." Act at once as this Free Trial opportunity may not be offered again.

FREE BOOK

CHICAGO TECHNICAL SCHOOL FOR BUILDERS,
Dept. R-140, Chicago Technical Bldg.,
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Please send your Free Books and Blue Prints which I understand are mine to keep without obligation. It is also understood that no salesman will call on me.

Name.....

Address.....

City.....State.....

Occupation.....

CHICAGO TECHNICAL SCHOOL FOR BUILDERS

Dept. R-140 118 East 26th Street CHICAGO, ILL.

THIS is the electrical age, with unlimited opportunities for the man who has educated himself in the finer points of electrical practice.

Fit yourself for one of the really big jobs by knowing electrical practice complete, including inside and outside work, central stations, and the whole subject. With the aid of the Croft books you can know electricity as experts know it and put yourself in line for an expert's pay.

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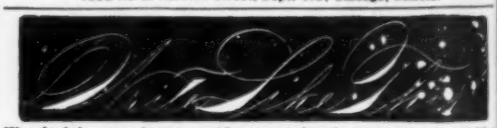

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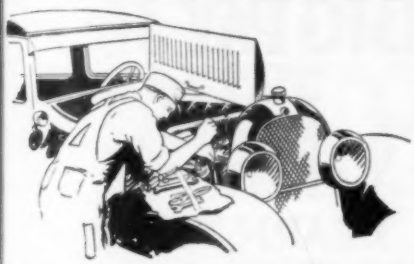

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AGENTS—$13.80 Daily in advance. Introducing New Insured Hosiery for men, women, children. Must wear or replaced free. 57 styles, 39 colors including latest "Silk to the Top" Ladies' Hose. Nyland made $595 in one month. Edwards, $460.60. Mrs. Bone, $425.45 Why not you? Even spare time should pay you $3.00 an hour. No experience needed. We furnish samples. Silk hose for your own use free. New Plan. Write Quick. Macochee Company, Road 25612, Cincinnati, Ohio.

AGENTS $240 month. Bonus besides. Dri-Klean—It makes car look like new. Slickest thing you ever saw. Removes dirt, grease, road oil, all one operation. No soap or water used. Clean any car for 10c. Wonderful seller. Exclusive territory. Write for sample. American Accessories Co., Desk 1831, Cincinnati, Ohio.

JIFFEX—Pays all profit! Invest $1.00, make $20.00. Enclose $1.00 bill, receive charges prepaid Jiffex for 10 gallons (80 pints) earning you $20. Jiffex Amazing Glass Cleaner, cleans, polishes windows, windshields, showcases without water, soap or chamois. Wonderful demonstrator. Everybody buys on sight! Receive also many other agent's profitable paying propositions. Satisfaction guaranteed. Miller, Chemist, 1706-F Jetton, Tampa, Fla.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 26.

AGENTS—Best seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at a saving of over 800 per cent; put it on cold, it vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Philadelphia, Pa., Dept. 505.

AGENTS—$6.00 hour earnings making four sales hour. Tremendous demand $3.50 article, powerful selling plan. Fagley & Halpen, Dept. 40, Phila., Pa.

AGENTS—Everybody buys "Croff's Universal Metal Polish." Cleans and brightens all metals. 100% profit. Field unlimited. Particulars free. Orlando Products Co., Box 132, Milford, Mass.

AGENTS—America's greatest sensation. 6 new record-breaking sellers. Enormous demand; tremendous profits. Write quick for details. United Service, 500 Fifth Ave., New York.

MEN—Women, $1.80 an hour. No less. Large Mfg. Co., established 30 years. Starting new medallion dept. Amazing new sales plan. First 22 agents average $1.80 an hour steady. Only 1 agent wanted in locality. Your Own Photo Free as sample. Art Medallion Co., Dept. 61, Corner Campbell and Jackson, Chicago, Ill.

HANDPAINTED Lingerie holders. Samples 10c (Coin). E. Mack Company, 15 Mechanic, H. Canton, N. Y.

MANUFACTURE Radiant glass name and number plates, mirrors, signs, etc. Besides teach others! Investigate! Radiant Signs, 15905 Alden, Detroit, Mich.

FASTEST Selling automobile seat covers; Spanish trimmed; most successful and reliable; lowest prices; spot cash commissions. Write for complete outfit, colored folders, etc.—free. Elliott Textile, Dept.-K, 6301 South Park, Chicago.

FORD Gas Saver Free. To advertise. Fits any auto. Enormous mileage increase. Critchlow, G3-805, Wheaton, Ill.

AGENTS—Sell Apex needle threader, marvelous new invention makes threading easy. $1 bill brings 7 threaders, retail $1.75. Money back if not satisfied. Jos. McMenamin, 1129 Shelmire, Philadelphia, Pa.

OHKAY Money maker. Sample free. Osman, 1728 Seventh St., N. W., Washington, D. C.

YOU Can sell every merchant in your town. Write for proposition. Geo. Speers & Sons, 434 So. Dearborn St., Chicago.

POLISHERS-Simonizers, earn $15 daily full, spare time. Demonstrate amazing new polish proclaimed best by experts. Experience unnecessary. Liberty Chemical, 3557 W. 22nd, Chicago.

SALESPEOPLE—Men and women can earn $1.50 or more an hour, selling our F. & M. Liquid Heater, which retails for $2.50 each. For complete details, write to Francis T. Manion, Sales Manager, F. & M. Liquid Heater Co., 1521 Maple St., Wilmington, Del.

TWO Amazing new inventions; one solves blurred windshield problem; one rub keeps glass clear 24 hours; other ends home window washing drudgery; eliminates ladders, buckets, sponges, rags; low priced; 150% profit. Security Mfg. Co., Dept. 1, Toledo, Ohio.

AGENTS Wanted to sell men's hats direct from factory. Send for catalog. Model Hat Mfg. Co., Dept. P-9, East Orange, N. J.

AGENTS—You can make big money working full or spare time selling our line of silk, silk and wool hosiery. Our new fall and winter line going strong. Your pay in advance if you want it. Write at once for particulars. Queen City Hosiery Co., Box 301, Bangor, Me.

MAN in each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

AGENTS—$100 a week for full time; $25 to $50 spare time. Equipment and car free. Exclusive territory. Sound, permanent proposition. A rare opportunity, but you must act quickly. Write for particulars today sure. American Products Co., 9598 Monmouth, Cincinnati, O.

AGENTS become a regular established McConnon dealer; buy on credit, sell for cash or credit. 185 absolute household necessities; all repeaters. Enjoy a sure income 52 weeks per year, year after year. City or country trade. Capital, experience unnecessary. McConnon & Co., Dept. 835, Winona, Minn.

AGENTS—Make Christmas money selling our Luminous Crucifix which Shines in the Dark. An ideal Christmas gift—Easily demonstrated—Big profits. W. G. Hannan Co., 2539 So. State St., Chicago, Ill.

SLICKERS—Raincoats. Lowest prices, largest commissions. Outfit free. Sample on trial. $2.65. Hamilton Raincoats, 4111VY Gladys Ave., Chicago.

AGENTS, every Car Owner and Housewife will buy Auto Mitten Dusters. Sample offer and Particulars free. National Fibre Broom Co., St. Louis, Mo.

REAL Money selling a great new Health Invention generating Violet Ray, Vibration, Electricity and Ozone. Exclusive Territory now open. Write today. Lindstrom & Co., 29 W. Lake St., Dept. A, Chicago.

AGENTS: Free Prize Auto Contest. Sell smoking sets; Two Pipes, Cigar, Cigarette holder, beautiful lined Case. De Luxe Pen and Pencil set, velvet-lined case, marked $10.00, Sell for $2.75. Large commission each sale. Agent sending most orders wins Pontiac-Six Auto or $850.00. Details Free. E. H. Sieg, Box 252, Red Wing, Minn.

AGENTS—Big Seller—$20 Daily Easy selling Taylor Caps — made-to-measure — every man buys—some want 2 or 3 caps. Samples Free and Cap free to agents. Write quick for fast money-making proposition. Taylor Cap Manufacturers, Dept. C-17, Cincinnati, Ohio.

MAKE $25.00 daily selling colored Raincoats and Slickers; Red, Blue, Green, Etc., $2.95. Hat Free. Commissions daily. Outfit Free. Elliott Bradley, 241 VanBuren, Dept. AB-12, 1-S, Chicago.

MAKE $95 a week! Sensationally new, different Self-Wringing Mop, Women buy at sight! Keeps hands out of dirty water. Practical—guaranteed. Amazingly low priced. Free samples offered. Delphos Mop Co., 2012 Washington St., Delphos, Ohio.

SOMETHING New! $75 a week easy. "Self-Flex." finest leather belt, has hidden spring. Belt expands and contracts. No rubber. 100% more comfort. Initial buckles. Buyers everywhere. Free sample. Self-Flex Co., 220 W. Institute Place, Chicago.

AGENTS: Special Radio proposition taking the country by storm. Everybody buys. Big profits for hustlers. Catalog free. Barco Company, Dept. A3, 1251 Wabash Avenue, Chicago.

DON'T sell for others. Employ agents yourself. Make your own products. Toilet Articles, Household Specialties, etc. 500% profit. We furnish everything and show you how. Valuable booklet free. Write at once. National Scientific Laboratories, 1519W Broad, Richmond, Va.

AGENTS—Make $15 daily. Show samples and distribute teas, coffee, spices, extracts; 200 products; things people eat. I go 50-50 and furnish Chrysler closed car. Offer made to first person answering in your locality. Write or wire Health-O-Quality Products Company, Dept. 101-P, Cincinnati, Ohio.

SELL Radio antenna. Big profit. Address Noirot Bros., 517 Franklin, Peoria, Ill. Dept. P.

AGENTS—$13.80 Daily in advance (Sworn proof) Introducing New Insured Hosiery. Guaranteed one year. No capital or experience required. Your pay daily. Monthly bonus besides. We supply samples. Silk hose for your own use free. Milton Mathews, Road 58612, Cincinnati, Ohio.

100 MORE active men to Introduce "Chieftain" Guaranteed Tailored Shirts 3 for $4.95. Latest novelties, colors, styles. Dickman, Illinois, in 3 weeks made $589; Sinton, Texas, in 12 days, $219.60; Bend, Iowa, in 16 days, $334.80. Why not you? No experience or capital needed. We deliver and collect. Full working outfit free. Cincinnati Shirt Company, Lane 15812, Cincinnati, Ohio.

PLAID Slickers and hat $2.98; also new scrotex and hidelike coats. Outfit free. American Waterproof, 724-P Roosevelt, Chicago.

WOMEN—$2 an hour spare time; 100% commission, new idea sanitary necessity; sells on sight; every woman buys; new feature never before used; designed by physician; revolutionizes old uncomfortable methods; pay every day; no deliveries, no collections, no experience or capital required. Write Mary P. Coleman, Meriden, Conn.

OUR 4 for 1 plan sells our Foods fast. Big repeaters. Result getting helps. Outfit free to workers. Write F. Lingott, 558 Congress, Chicago.

FLAVORING Extracts—Bottle Yourself! Concentrated — add water! Free labels. Whirlwind Sellers! 500% Profit! Money-making opportunity. Write Thomas Manufacturing Company, Indianapolis, Ind.

COMBINATION Leatherettes $6.98. Commission $1.75. 6x9 swatches increase sales. Complete line raincoats, topcoats, slickers, $2.68 up. Elaborate outfit free. Amazon, 1101 N. Robey, Chicago.

LATEST Fad—Samples free—show them to friends—make money. Castle Studios, Independence, Mo.

AGENTS Make $40 to $80 weekly selling typewriters re-manufactured like new by the "Young Process." Lowest prices and easiest terms ever offered. Big commission —no investment—real opportunity to start in business for yourself. Write today. Young Typewriter Co., Dept. 710C, 654 W. Randolph St., Chicago, Ill.

NO Peddling. Start own business. Home, Office. Big profits. Free particulars. Elite, 38H Elizabeth St., N. Y.

AGENTS—200% profit. New, highly practical, useful article for every home and office. Quick seller. Hydrawlik Corporation, Roselle, N. J.

WRITE Atlas Sign Works for free working equipment. Beautiful window sign letters. Penny each! Any size. Wonderful offer to general agents. K1032 E. 55th St., Chicago.

AGENTS, Big Money selling perfect saw filers, $12.50. Discount 40%. Circulars. Hoof Mfg. Co., Minneapolis, Minn.

DON'T read this unless 300% profit interests you. Everybody buys on sight. Free sample. Magic Products, Dept. 200, Oak & 31st, Kansas City, Mo.

RELIABLE Man for Sale-Agency, for "Dreadnaught" Greasebattler and Ace Hand Soaps. D. P. C., 3138 Southport Ave., Chicago, Ill.

PENNANTS—Headquarter — Colleges — States—Cities—Sample: 25c. $1.75 dozen. Omana Pennant Works, 715 Baltimore Building, Chicago.

RADIO Agents—Make big money—Easy! selling marvelous new sets and accessories. Buy from factory at lowest prices. Get new catalog with thousands of nationally advertised bargains. Free Call Book. Write today. American Auto and Radio Co., Dept. 268, American Radio Bldg., Kansas City, Mo.

MAKE $100 weekly supplying demand for new invention. Makes autos run on 7% gasoline. Free sample. Write Whirlwind Co., 990-492 E. Third St., Milwaukee, Wis.

JUST Out—New Patented Apron. No strings or straps—$20.00 a day every day; over 100% profit; commissions daily. Write for free offer. Sta-Put Co., Dept. 212, St. Louis, Mo.

$50,000. PICTURE Man Friedman made canvassing. Beginners can make $100.00 weekly with my sales talk. Experienced men make more. Free book. "Profits in Portraits" explains. Sample Free. Picture Man Friedman, Dept. 8-B, 541 W. Lake, Chicago.

NEWEST Invention! Abolishes kinks and snarls. Automatically coils telephone, electric iron and lamp cords. Housewives, companies actually buying 5 to 50. Tremendous profits. Samples furnished all salesmen. Neverknot, Dept. 12-A, 4503 Ravenswood, Chicago.

$18 TO $25 daily. Biggest selling line of 2-piece suits, $9.95 and $12.50; 3-piece wool suit, $17.95 (regular $28.00 value). All-wool overcoat, $18.50. Splendid raincoats, slickers and boys' suits. Biggest commissions. Free outfits. "Jim" Foster, Inc., Dept. 212, 2250 S. Spaulding Ave., Chicago, Ill.

AGENTS, portraits, photo-pillow tops, frames, sheet pictures, medallions, photo-jewelry, guaranteed hose laundry tablets, food products, toilet requisites, luminous crucifixes. Catalog 50 specialties free. 30 days' credit. Jas. C. Bailey, Dept. C-12, Chicago.

WE pay $50 a week and expenses and give Ford Auto to men to introduce poultry and stock compounds. Imperial Co., D23, Parsons, Kan.

AGENTS $17.50 daily. Bonus besides. Auto furnished. Introduce finest hosiery. Seven months guarantee. New selling plan gets business fast. No experience needed. Write for samples. Betterknit Textile Co., Silk, 1431, Greenfield, Ohio.

AGENTS—Make two dollars hourly. Sell new kind of Sharpners. Sharpens all knives, tools, quickly. Demonstrating sample free. Premier Mfg. Company, Dept. 74, Detroit, Mich.

NEW INVENTION—400% profit. Liquid quick mend for Fabrics and Hosiery. Stops runs. Every woman buys. Hundred other fast sellers. J. E. Johnson Co., Dept. 460, 6129 Wentworth, Chicago.

AGENTS: Make $500.00 monthly. Pay daily. No investment. Rhinestone Initial buckles and Novelties. Sell easy everywhere. Exclusive territory. Chaton Novelty Co., 606 Blue Island, Chicago.

AGENTS—Mosco Corn and Callous Remover will build you a steady repeat business. Send today for Pocket-size trial outfit. The Moss Co., 396 Searle Bldg., Rochester, N. Y.

NEW Household Device washes—dries windows, sweeps, cleans walls, scrubs, mops. Costs less than brooms. Over half profit. Harpers, 132 Third St., Fairfield, Iowa.

AGENTS make $3.00 an hour taking orders for our 40 fascinating kitchen specialties. No competition. Write quick. General Products Co., M-207, Newark, N. J.

SUPERKEEN! Amazing New Patented Magnetic Blade Sharpener! Sharpens All Razor Blades Instantly, Magically, By Powerful Magnetic Force! New! Absolutely different! Sensational Demonstration! Whirlwind Seller! Write for Pocket Sample! SuperKeen, Dept. B-12, Salisbury, N. C.

MIRRORS Resilvered at home. Costs less 5 cents per square foot; you charge 75 cents. Immense profits plating autoparts, reflectors, tableware, stoves, refinishing metalware, etc. Outfits furnished. Details Free. Write Sprinkle, Plater, 128, Marion, Ind.

BIG Money for men and women selling wonderful Whitehouse Stove Polish, Devil Dog, Walnut Flavoring, Beauty Creations, etc. Write quick. Blair Laboratories, Lynchburg, Va.

"WHERE to buy half million articles wholesale." 72-page directory offers unlimited opportunities for agents. Free particulars. Pruitt System, Brookfield, Ill.

NOW Earn $15 a Day Easy. Take orders for shirts. Factory prices. Samples Free. Write quick. Fashion Wear Shirt Co., Dept. S-943, Cincinnati, O.

MAKE $50 to $75 a week. Everyone needs shoes. Sell Mason's all-leather shoes, amazingly low prices. 85 styles—men's, women's, children's. No experience needed. Big outfit Free. Mason Shoe Mfg. Co., Dept. 2212, Chippewa Falls, Wis.

AGENTS $72 a week—take orders for Guaranteed Cutlery, Knives, Razors, etc. Big commission. Exclusive territory. Big money for spare time. Write quick. Novelty Cutlery Co., Desk 631, Canton, Ohio.

AGENTS, Men Women, for Fast Sellers, Good Profit. Write to Miller, Box 3, Tremont Station, New York City.

AGENTS—Engraved name plates, signs, numbers; profits large; samples free. Brett Bros., Roxbury Crossing, Boston, Mass.

AGENTS; for big quick profits, try our new adjustable waterproof aprons; 100% profit. B. & G. Rubber Company, Dept. 289, Pittsburgh, Pa.

AMAZING Discovery Brillianite diamonds, Baffle experts, rivals the genuine African diamond in dazzling brilliancy. Make $100 weekly. Particulars Free. Brillianite Co., E5643 Prairie, Chicago.

BIG Pay every day! Complete guaranteed line direct to wearer. Dress shirts, work shirts, flannels, overalls, pants, leather coats, sweaters, playsuits, $10-$25 daily! Experience unnecessary. Big outfit free. Nimrod Co., Dept. 8, 4922-28 Lincoln Ave., Chicago.

CHAMOIS-Ray, 200% profit, all-metal polisher, latest invention. Le Soleil Company, 1454 Wellington, Chicago.

AGENTS—Stamping names on pocket-key protectors; sample check with your name and address, 25c. Stamping outfits. Emblem checks, Check fobs, name plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

CHECK protection experts make $120 weekly with ease. Free training now offered for this fascinating new profession. New checkwriter equals any machine on market at fraction of cost. Merchants, professional men, business men buy it at sight. Permanent, dignified position. Write quick for details and special offer. Arnold Checkwriter Co., Dept. W-10, Flint, Mich.

AGENTS $240 month and auto to travel in. Bonus besides. Introduce new line guaranteed hosiery for men, women, children. 126 styles, colors. Beats store prices. Guaranteed to wear 7 months or new hose free. Finest line Silk Hosiery you ever saw. New sales plan. Credit given. Spare time satisfactory. Write for samples. Wilknit Hosiery Co., Dept. 3631, Greenfield, Ohio.

DON'T sell for others. Employ agents yourself. Make your own products. Toilet Articles, Household Specialties, etc. 500% profit. We furnish everything and show you how. Valuable booklet free. Write at once. National Scientific Laboratories, 1919W Broad, Richmond, Va.

BIG Winner for Agents. New patented cigarette case. Holds package cigarettes and box safety matches. beautiful, compact, flexible container; large profits; write for liberal proposition. All-in-One, Dept. A-12, 2810 Portland Ave., Minneapolis, Minn.

$100.00 WEEKLY! Two Suits or Suit and Overcoat $33.50, All wool—Made to Measure. Commission $6.00-$7.50. Outfit Free. Garfield Tailors, BD, 1557 Milwaukee, Chicago.

FURNITURE Refinishing, Polishing, painting, handyman shop; wonderful profits; start yours on nearly nothing. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

SELL Handy wire stretcher, a simple, practical fence-repairing device. Hawbaker Stretcher Co., Elmore, Minn.

CHRISTMAS Novelty. Make $25 daily selling every store, office and home. Day or Evening. Sample and literature free. Consolidated, 65-C West Van Buren, Chicago.

AGENTS, Big Opportunity to make money, easy. Men's fancy hosiery, imperfects. $13.20 Gross Pairs; Rayon Silk $10.80 Gross Pairs. Send $25.00 for the above two gross pairs, Post Paid. Last opportunity. Lewis Hosiery Company, 12 N. 3rd Street, Philadelphia, Pa.

NEW tested sales plans gets orders from empty cars for new Suction Ash Receiver. One out of every 5 circulars distributed come back with dollar bill. 100% profit guarantees $20 to $50 a day. Territory going fast. Write immediately. Gordon Co., 110 East 23 St., New York.

$15 DAILY, easy. Pay advanced. New two tone aviator style rain coats. Big selling outfit free. Fisk Warner, 443 So. Dearborn, Dept. M, Chicago.

FORD Gas Saver Free. To advertise. Fits any auto. Enormous mileage increase. Critchlow, G4-805, Wheaton, Ill.

$60-$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

AGENTS—Big Profits selling useful novelty. Good side line for any class of trade. Sample and circular free. Travelia Sales Co., Dept. P, 123 Liberty St., New York.

AGENTS: Our gold-eyed Needle Cases are wonderful sellers; immense profits; $50 to $300 weekly; proof and particulars free; sample outfits 10c; factory prices. Paty Needle Co., 231 Davis Square, Somerville, Mass.

AGENTS—We start you in business and help you succeed. No capital or experience needed. Spare or full time. You can earn $50-$100 weekly. Write Madisch Company, 566 Broadway, New York.

$31.00 PROFIT—with $1.50 Outfit—Big Money—Easy Work. Selling Gold Monograms for Automobiles, Luggage, Windows, Wagons. No experience. No license. "Samples Free." NuLife Monograms, Hartford, Conn.

RELIABLE People Wanted—place Eggine in stores and appoint agents. Used same way as eggs in baking and cooking, rate 9c dozen. Always fresh. Large package 10c postpaid, with particulars of our other fast sellers. Morrissey Company, 4417-25 Madison St., Chicago.

AGENTS, get our prices. Largest reliable line toilet preparations and home remedies, including valuable premium coupons. Prompt service. Established 1867. Valuable selling plans. Lab. 11, F. Ad Richter Co., Berry and S. 5th Sts., Brooklyn, N. Y.

EVERY Woman Wants a Sewing Set. Home Sewing Sets contain 142 useful sewing articles. $4 an hour easily made with this 50c seller. Lee Bros., 128 E. 23rd St., New York.

REAL Whirlwind Seller—Nopulout Custom Shirt. Every man buys them. Patented—no competition. Liberal commission. Free selling kit. Make $15 up daily taking orders direct from consumer at manufacturer's prices. District or local agents. Write Nopulout Shirt Co., Dept Y, Hazleton, Pa.

SELL real necessity. Novelty Shirts, Hosiery, Neckwear. Colonial Novelty Co., Geneva, N. Y.

REPRESENTATIVES wanted by over 500 manufacturers, offering real money-making propositions. No need of being out of work. Write for Free copy. Opportunity Magazine, 750 N. Michigan, Service Dept., Desk 2, Chicago.

ARVEO Polishing Cloths offer big profits to salesmen. Sample and particulars free. Arveo Industries, Box F 147, Grosse Ile, Mich.

AGENT Repeaters cost 10c, sell 50c. List free. Thorn-Burr, Carthage, Ill.

AUTO owner tire agent wanted each locality to use and take orders for hand made Mellinger cord and balloon tires; guarantee bond 15,000 miles; shipped prepaid on approval; get your tires free; no capital or experience required; make $100 to $300 weekly. Write for wholesale prices and sample kit. Address Mellinger Tire Co., Dept. 400, Kansas City, Mo., or Dept. 400, Philadelphia, Pa., or Dept. 400, Oakland, Calif.

PHOTO Medallion Agents Earn $20 Daily. Easy work collecting photos. Big line; quick sellers. Capital or experience unnecessary. Give you 4-day service on beautiful photo reproductions. Reserve your district today. Write Pudlin Corp., Dept. 103, 259 Bowery, New York.

$5,000 A YEAR—Selling Perry Photo Medallions. Big demand. Ready sales. 400% to 600% profits. Any photo copied perfectly on Medallions, Mirrors, Compacts, Jewelry, etc. Guaranteed likeness. Investigate. Free catalog, full details on request. Write Today. PM. Perry Photo Novelty Corp., 1793 Jerome Ave., New York.

AGENTS—Mosco Corn and Callous Remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Co., 337 Searle Bldg., Rochester, N. Y.

SIMPLEX Vaporizer—Wonderful invention; 20-60% increased mileage guaranteed; retails $1; free trial; exclusive territory. American Fixture Co., 234 West Water, Milwaukee, Wis.

SEND name, address on postcard. Free introductory copy Salesology Magazine; contains 1,000 money-making opportunities. Offered by big reliable firms; no obligations. Salesology Magazine, Desk B-38, 500 No. Dearborn, Chicago.

AGENTS make $100 week furnishing Cigar Lighters to merchants on free advertising plan. Particulars sent free, write at once. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

FREE Sample. "Rain Shield Wiper." Retails $1.00—Cost (25 cents). Sold Clear and Rainy Days. No Cloth—No Paste—No Attachment. (1) Rub keeps windshield clear 48 hours. Experience Unnecessary. NuLife Corporation, Hartford, Conn.

PATENTS. Time counts in applying for patents. Don't risk delay in projecting your ideas. Send sketch or model for instruction or write for free book "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 156 and 157.

NEW: Just invented; Comb fastens anywhere. Send 10c for a 25c value. Never Lose Comb Mfg. Co., Lesueur Center, Minn.

JUST Out, new cigarette vendor. Positively the most beautiful high-class dependable Vending machine made. Practically Slug Proof. Built to last indefinitely. Agents make fortunes by acting quickly. Manufactured exclusively by the National Sales Machine Company, Dept. B, 1926 Chestnut St., St. Louis.

SHOP Agents or General Agents to sell new large cans of Paste Hand Soap—fine profits—quick sales. The Connecticut Can Co., Hartford, Conn.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept 2480, St. Louis.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404, Amsterdam, N. Y.

NO Dull Times Selling Food. People must eat. Federal distributors make big money; $3,000 yearly and up. No capital or experience needed; guaranteed sales; unsold goods may be returned. We furnish you with sample case, license and Free Samples for customers—Sure repeat orders. Exclusive territory. Ask now! Federal Pure Food Co., A2307 Archer, Chicago.

POLMET—The Wonderful Polishing Cloth that cleans all metals without liquid, paste or powder. Approved by "Good Housekeeping" and "Modern Priscilla"—sells fast at 25c. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston.

PHOTO Medallion Men and Women, the largest line of Photo Novelties in the world. Lowest prices, quickest service. Send for catalogue showing over 200 money makers. Photo medallions, photo medallion clocks, photo mirrors, photo fountain pens, photo powder compacts, photo jewelry and photo buttons. Gibson Photo Jewelry Co., 608-614 Gravesend Ave., Brooklyn, N. Y.

AGENTS: 500% profit. "Happy Home Make Shampoo" builds your own big business. Martin of Indiana made $75.00 in one day. Missouri man made $750.00 one month. Exclusive territory. Geo. A. Schmidt & Co., Dept. P, 236 W. North Ave., Chicago.

REPLATE brassy worn-off Automobile parts, Reflectors, Bath Room Fixtures, Worn Spoons, Forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury. $1.00 half pints. Post Paid. Satisfaction Guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

AGENTS make $10.00 Daily selling Non-Splash Water Filters on sight. Best canvasser's article on market. Investigate. Write for particulars, Desk 14, Seed Filter Company, 73 Franklin Street, New York.

FIBRE Brooms—detachable handles, fine finish. Good profits, repeat sales. The Fibre Broom People, 147-C New Jersey Ave., Brooklyn, N. Y.

MONOGRAM Automobiles, $1.35 Profit ten minutes' work; every owner wants them; millions without; particulars free. Motorists Accessories Co., Mansfield, Ohio.

ONE of the biggest mails on earth. Sent to any address for 10c. Louisiana Distributing Service, Dept. PM, Harmon, La.

PORTRAIT Agents—Write for new Catalogue—Enlargements, Frames, Medallions, Sheet Pictures, Luminous Crucifixes. Adam J. Kroll & Co., 2539 So. State St., Chicago, Ill.

WANT Distributing Agent for Handslick, powdered hand soap; removes anything from hands; everybody a customer; sample free. Solar Products Co., J-2142 S. Troy, Chicago.

ALL-YEAR-ROUND profitable business selling wonderful new water softener and cleaner. Removes grease, oil, ink and dirt quickly. Every home and business place a live prospect. 100% profit. Big repeat orders. Exclusive territory. Write for free sample. Seacoast Laboratories, Sea Bright, N. J.

GOLD Leaf window letters and script signs. No experience; 500% profit. Samples free. Consolidated, 69-U West VanBuren, Chicago.

REMNANT Store, Bethel, Ohio. Greatest Dry Goods Bargains on Earth. Agents and Dealers.

AGENTS — Clever Invention! Teaspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

GET Our Free Sample Case—Toilet articles, perfumes and specialties. Wonderfully profitable. La Derma Co., Dept. A, St. Louis, Mo.

DON'T sell for others. Employ agents yourself. Make your own products. Toilet Articles, Household Specialties, etc. 500% profit. We furnish everything and show you how. Valuable booklet free. Write at once. National Scientific Laboratories, 1919W Broad, Richmond, Va.

AGENTS—Art tapestry patterns in colors Opportunity. Illustrated catalog free. S. Plocki Suite 707, 58 East Washington St., Chicago, Ill.

RELIABLE aggressive agents needed to sell Holley Suction and Force Pumps. Used in clearing plugged plumbing fixtures. Sizes for every need. Readily salable, and show good profit to consistent workers. The Holley is priced below competition and offers, at the same time, exceptional quality. Worthwhile for worth-while men. Alert Products, Inc., Dept. 50, Holley, N. Y.

32 SECONDS complete tire change by Detmer, Ohio, with Morey Quick Action Rim Tool. Sold, singly, 49 three days, cleared $100. Anderson, Mont., sold 1400 in 14 weeks. Get details for good territory. Harvest time Now. M. Morey Rim Tool, Buffalo, N. Y.

AT Last! Diamond Rival Discovered! Amazing blue white Rajah Gem astounds jewelry world and deceives experts. Beautiful sample case free! $100 weekly. Quick! Rajah Diamond Co., Dept. F20, Salisbury, N. C.

SELL men's neckwear; wonderful proposition. Astor, 318-M Broadway, New York.

$16 A DAY Easy—I start you in auto accessory business; no investment; no experience necessary. Landin, 4206 Montrose Ave., Chicago.

LAMB'SWOOL Polishing Mittens, Brushes. Newhall, 358 Broad, Lynn, Mass.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

DON'T sell for others. Employ agents yourself. Make your own products. Toilet Articles, Household Specialties, etc. 500% profit. We furnish everything and show you how. Valuable booklet free. Write at once. National Scientific Laboratories, 1919W Broad, Richmond, Va.

FORD Gas Saver Free. To advertise. Fits any auto. Enormous mileage increase. Critchlow, G5-805, Wheaton, Ill.

GENUINE Gold Leaf Letters anyone can put on store windows. Guaranteed to never tarnish. Large Profits. Enormous Demand. Free Samples. Write today. Metallic Letter Co., 438-D North Clark, Chicago.

SUCCEED With Your Own Products. Make them yourself. Formulas, Processes, Trade-Secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

FREE Sample of lace handkerchief. Lightning-quick seller. Big profits. Earn $30.00 daily. Send 10c for mailing charges. Other flash sellers also. Lewis Importing Co., 143 Fifth Ave., New York.

AGENTS to distribute sample puzzles and catalogues, evenings. Catalogue for stamp. B. Z. Puzzles, Fairview, Mass.

SELL Wonderful Hand Adding Machine. $1 wholesale. Retail, $4.50. Typewriter Supply, 102 Hersch Bldg., Pittsburgh.

RAINCOATS—Full line, all prices. Also Sheeplined coats—shirts. Outfit free. Commission 25% with bonus. Hydro Raincoat Co., 718 Independence, Dept. 45, Chicago.

$100.00 WEEKLY. Sell nationally known product and appoint agents. N-R-G Co., B234 W. Superior, Chicago.

$1,600.00 CLEARED in 30 days by one agent. New Amazing Cleaner. Sample Free. Bestever Products Company, 4317-P, Irving Park, Chicago.

AUTOMOBILE Specialties. Guaranteed formulas for all latest money makers. Lowest prices. Write for free lists. Murphy, Chemist, Tujunga, Calif.

BIG profits distributing 5c candy specialties to dealers. Fast sellers. Exclusive territory. Universal Sales Company, 631-B Wilson Ave., Brooklyn, N. Y.

AGENTS—250% profit selling exclusive new process Artistic Signs. Finest selection of stock signs in the country, barring none. Details free. Sample 10c. Artistic Signs, 799-R Broadway, New York, N. Y.

SEND 25 cents for a one dollar Cigar Lighter, and learn how to make $10 a day. Particulars free. Rapid Mfg. Co., 799 Broadway, New York City.

EARN $10 daily silvering mirrors, plating, refinishing metalware, chandeliers, headlights, bedsteads. E. Decie Laboratories, 225 Varick St., New York.

$50.00 WEEKLY easy. Applying Gold initials on Automobiles. No experience needed. $1.45 profit every $1.50 job. Free samples. "Raleo Monograms," X1043 Washington, Boston, Mass.

FREE: Large wholesale Specialty catalog, showing latest best sellers from many parts of the world. Spors Co., Lesueur Center, Minn.

A BUSINESS of Your Own — Making Sparkling Glass Name and Number Plates, Checkerboards, Signs. Big Book and Sample Free. E. Palmer, 512 Wooster, Ohio.

SOMETHING New. Every motorist a buyer of our electro-magnetic-emergency Wonderlamp; takes only one minute to demonstrate and make a sale; no experience necessary; $5.00 an hour easily made; full time or evenings. Write for sample. Wonderlamp Co., 926 Fisk Bldg., Dept. 10-A, New York.

CALIFORNIA perfumed beads selling like hot cakes. Agents coining money. Big profits. Catalog free. Mission Factory P, 2328 W. Pico, Los Angeles, Calif.

HIGH-GRADE SALESMEN WANTED

SALESMEN—Manufacturer of established line guaranteed tools offers profitable connection to men with mechanical and some sales ability; part-time men considered; two average sales daily net $50 weekly; advance against commission. Write for free catalogue and money-making plan. J. G. Woods, Inc., Dept. 112, 37 W. 20th St., New York, N. Y.

BIG Season Just Ahead. Advertising pencils most popular every day—every business prospect. Our line repeats. Big commissions. Established in 1902. North American Pencil Works, 126 So. Clinton, Dept. 55F, Chicago.

MEN—Sell dependable shrubbery, fruit trees, etc. Steady demand. Complete cooperation. Commissions paid weekly. We deliver and collect. Write Perry Nurseries, Dept. R-12, Rochester, N. Y.

DON'T sell for others. Employ agents yourself. Make your own products. Toilet Articles, Household Specialties, etc. 500% profit. We furnish everything and show you how. Valuable booklet free. Write at once. National Scientific Laboratories, 1919 W. Broad, Richmond, Va.

WALKER Made $165.00 First Day selling Collection System to Doctors and Merchants. Retails $6.50. Collects $65.00, Costs $1.50. Adjustment Bureau, Mobile, Ala.

LIVE Salesmen can easily make $15.00 or $20.00 a day selling Utility Stools direct to the home. 200% profit. Send for full information today. If you will send money order of fifty cents we will send you sample stool. If you are not satisfied with its sales value return to us at our expense. This is not an ordinary offer but is a real opportunity. Nappanee Lbr. & Mfg. Co., Nappanee, Ind.

EASY to sell groceries, auto oils, to consumers from samples. Big pay in advance. Liberal credit. We pay freight. Capital or experience unnecessary. Loverin & Browne, K-1500 So. State, Chicago.

EARN $20 a Day. Establish income for life selling for $1 a year, $1,500 accident policy. Write W. C. Stone, 11 So. LaSalle, Chicago.

PUNCHBOARD Salesmen. Amazing new line worth $100 up weekly—Boards, Vending Machines. Iowa Novelty Co., Dept. 18, Cedar Rapids, Iowa.

SALESMAN—Calling on the radio trade to sell Orthocone speakers—nationally famed for their wonderful tonal qualities. Low price, liberal discounts to dealers. Big commissions. An unusual moneymaking opportunity for you. Sample furnished. References required. Write immediately to Orthocone Speaker Co., 2728 St. George Court, Chicago, Ill.

SELL printing. Big commissions. Outfit Free. Atlas, 2622G East Tenth, Indianapolis, Ind.

ANTIFREEZE prevents radiators freezing. Dricleen, the combined auto cleaner, polisher. Radiator, internal cleaner. Hand soap. Write for free shipment long-profit auto specialties. Mickman Co., St. Paul, Minn.

MAKE $25.00 daily selling colored Raincoats and Slickers; Red, Blue, Green, Etc., $2.95. Hat Free. Commissions daily. Outfit free. Elliott Bradley, 241 VanBuren, Dept AB12-S, Chicago.

SALESMEN—Just out, $8.88 for men's suits; commission $3.00 in advance; free selling kit. The 888 Company, Dept. 121, K., Ft. Wayne, Ind.

MR. BRUSH Salesmen—Old Established New York Brush Manufacturers require services of men in all territories to sell their extensive line of Sanitary Twisted in Wire Brushes. We pay larger commission than any other Brush House in the country. Write immediately for proposition. Wire Grip Sanitary Brush Corporation, 15 Mercer Street, New York.

NO high-pressure salesmanship necessary selling Luminate, our Magic Electric Window and Outdoor Salesman. Demand established. Color, light, motion gets 'em. Greatest quick-change letter system and snappy two-color posters land orders on demonstration. Hustlers collecting $100 weekly, easy. Protected territory. Display Products Co., A407-9 East 31st St., Kansas City, Mo.

WONDERFUL Invention Seals Fifty Envelopes minute. Sells on sight at $3.50. Exclusive territory. Kendall Sealer Co., B20, East Jaffrey, N. H.

SELL Collection Comics to merchants, manufacturers, professionals. They get the money. Big profits. Sample assortment 10c. Collection Comics, 548 Van Cortland Park Ave., Yonkers, N. Y.

NEW Invention automobile shutter. Retails $1.50. Real winter proposition. Make $150 weekly easy. Jones, 804 N. Clark, Chicago.

AMAZING Invention pays agents $150 weekly! Unique combination gear shift ball-ash tray. 250% profit. Lifetime guarantee. Free particulars. Fisher, 7730 So. Chicago Ave., Chicago.

REPRESENT Auto Seat Cover Manufacturer. Make $125 weekly. Biggest commission paid daily. Lowest prices. Highest quality. Elaborate outfits Free. Marvelo, 333 South Paulina, Chicago.

TO Market 3A garage door holders, simple automatic action, quickly installed, instantly attracts garage owners, builders, dealers. Write for exclusive territory proposition. Knowlson-Stevenson Co., 1118 Packard, Ann Arbor, Mich.

EARN $10 daily silvering mirrors, plating, refinishing metalware, chandeliers, headlights, bedsteads. E. Decie Laboratories, 225 Varick St., New York.

SALESMEN—Become Independent. Own Your business, experience unnecessary selling our $7,500.00 Accidental Death; $50 Accident; $25 Sick Weekly Benefits—$12.50 Yearly. Other Amounts proportionate. Guaranteed steady income from renewals. $250,000 Deposited Insurance Department. Universal Policy, Dept. A, 30 Clinton St., Newark, N. J.

PUNCHBOARD Salesmen—making small towns. One sale a day nets you $105 weekly. Full commission on repeats. K&S Sales Co., 4395 Ravenswood Ave., Chicago.

ANY Salesmen Can Sell Them! Merchants everywhere use punchboards. Someone sells them, why not you? Collect big commissions daily. Newest, largest, elaborate catalog sent upon request. Lincoln Sales Co., 9 So. Clinton, Chicago, Dept. D.

$60-$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-A North Clark, Chicago.

SEND name, address on postcard. Free introductory copy Salesology Magazine; contains 1,000 money making opportunities. Offered by big reliable firms; no obligations. Salesology Magazine, Desk B-39, 500 No. Dearborn, Chicago.

DOUBLE Spark Plug—Two spark gaps; bigger, hotter spark on weaker current and leaner mixture. Guaranteed to be better than other plugs or money refunded. 50% Commission. Agents and side-line men wanted. Affinity Spark Plug Co., Box P-329, Omaha, Neb.

COLLECTS Money from the Dead-Beats. Retails—$5.00. Cost—$1.00. Profit $4.00. "New Method." Every Storekeeper, Doctor buys quickly. Wonderful Money Getter. Federal Association, Hartford, Conn.

GOLD Leaf window letters and script signs. No experience; 500% profit. Samples free. Consolidated, 69-V West Van Buren, Chicago.

PUNCHBOARD Salesmen. 2 hours daily, $100 every week. New line. Lowest prices. Full commission on repeat business. Catalog free. Puritan Novelty Co., 1409 Jackson, Chicago.

MAKE More money selling exclusive line of engraved personal Xmas cards. Largest commission paid. Art Craft Engraving Co., Dept. C, 117 N. Wells, Chicago.

SHOP Representative. Sell Reed Micrometers to shop friends. Liberal commission. Reed Small Tool Works, 35 Hermon St., Worcester, Mass.

SALESMEN—Sell men's Rayon Swiss and Jacquard ties—new startling features; highest commissions. Wonder outfit free. National Service Mills, 2054—83rd St., Brooklyn, N. Y.

TRAVELING Salesmen Calling on Retail Stores wanted by large manufacturer of fast-selling specialties entirely different from the average. Year-round sales, main or sideline. Big commission paid immediately on original and repeat business. Opportunity for well paid and permanent connection with old-established firm. If not making $150 weekly, write today. Union Specialty Works, Dept. 222, Boonville, N. Y.

TAKE orders for coffee, flour, dried fruits, canned goods, meat, staple groceries, toilet articles, paints, tires, auto and tractor oils. No capital or bond required. We deliver and collect. Permanent business. Big pay. Write at once. Hitchcock-Hill Co., Dept. 50, Chicago.

PUNCHBOARD Salesmen Take Notice: New, fascinating game Excitement. Can be used all states. $200 weekly easy. One-minute sales talk. Pay daily. Cigar Stores Novelty Co., Dept. G, Peoria, Ill.

40% COMMISSION selling printed business stationery at knock-out prices. Part or full time. Free outfit. L Process Service Minneapolis, Minn.

FOUR $7.50 sales to merchants net you $20.00 daily. Sayers Systems, 2813 Sheffield Ave., Chicago, Ill.

HELP WANTED

WHY not sell us your spare time? $2 an hour, $19.70 daily easy Full Time, Introducing New Style Guaranteed Hosiery for Men, Women, Children. Silk hose for your own use free. No capital or experience required. Your pay daily. Monthly Bonus Extra. We furnish samples. Macochee Hosiery Company, Road 26012, Cincinnati, Ohio.

MAKE $25.00 daily selling colored Raincoats and Slickers; Red, Blue, Green, Etc., $2.95. Hat Free. Commissions daily, Outfit free. Elliott Bradley, 241 VanBuren, Dept. AB12-M, Chicago.

SEND name, address on postcard. Free Introductory copy Salesology Magazine; contains 1,000 money-making opportunities. Offered by big reliable firms; no obligations. Salesology Magazine, Desk B-40, 500 No. Dearborn, Chicago.

WE Start You in Business, furnishing everything; men and women, $35.00 to $100.00 weekly operating our "New System Specialty Candy Factories." Few dollars start you home or small room anywhere. Booklet free. W. Hillyer Ragsdale, Drawer 350, East Orange, N. J.

OBTAIN Employment! 70 Jobs offered one person! Get work quickly, using our methods, or we'll promptly return your money. Complete instructions 50 cents. Better Yourself! New Idea Service Co., Box 39-A, Station K, New York.

REPRESENTATIVES wanted by over 500 manufacturers, offering real money-making propositions. No need of being out of work. Write for Free copy. Opportunity Magazine, 750 N. Michigan, Service Dept., Desk 3, Chicago.

MR. MAN! Big Money Refinishing Furniture, Radio-Cabinets, etc. Spare-time, Full-time. Experience unnecessary. Valuable information free. F. Jackson, 716 W. Exchange, Owosso, Mich.

WANTED 10,000 men at once. Wonderful opportunity. Full particulars and sample free. Big Four Co., 509 Ashland, Ohio.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 26.

MAILING LISTS

99% GUARANTEED Mailing lists. Accurate. Reliable. Guaranteed. The kind that produces business; compiled for every possible business or individual. Lists of every kind of any business or individuals compiled for your individual needs anywhere. Catalog and information on request. National List, 847 Broad, Newark, N. J.

500 NAMES rural families; first time offered, $1.00. Frame, Rockland, Ohio.

1,000, 1927 WOMEN'S names, $1.00. W. Sheasgreen, PM1427 North Penn, Minneapolis, Minn.

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WE mail to a definite class—opportunity seekers, active agents, small mail dealers, spare-time workers—First Class Mail, $3.00 thousand. Free Circular. Mid-West Mailing Bureau, Ferreston, Ill.

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EXECUTIVES! Proven business analysis forms assure fewer leaks—greater 1928 profits. $1.00 Standard Cost, PM1427 North Penn, Minneapolis, Minn.

INCORPORATE. Low cost. Chas. W. Barrick, New Martinsville, W. Va.

INFORMATION

HEIRS Wanted. "Lost Heirs"—A 92-page book filled with names for lost heirs and missing kin from different parts of the world. Chancery Court of England, Ireland and Bank of England lists included. Price one dollar. International Claim Agency, Dept. 189, Pittsburgh, Pa., U. S. A.

753 TIME, Labor and Money Saving Ideas for all who own, drive or repair autos. These practical kinks are based upon the actual experiences of hundreds of owners and repairmen. Three books, Auto Owners', Auto Repairman's and Auto Tourists' Handbooks, regular $1.50 value will be supplied at 98c plus the postage C. O. D. for a limited time only. Send your order today to Popular Mechanics Press, Room 912, 200 E. Ontario St., Chicago.

CARBURETOR Supplement to Dyke's Auto Encyclopedia—Just Out—Deals with every make of carburetor. Just what every auto service man has long been in need of. 106 pages, 246 illus. Price $2.00. Send for your copy today. C. O. D. if you prefer. Popular Mechanics Press, Room 912, 200 E. Ontario St., Chicago.

TYPEWRITERS AND SUPPLIES

UNDERWOOD Typewriters—only $3.00 down. Easy monthly payments. Low prices at less than manufacturers, 10 days' free trial. Rebuilt, all worn parts replaced. Just like a new machine. 5-year guarantee. Write for a big free catalog. Shipman-Ward Mfg. Co., 1519 Shipman Bldg., Chicago, Ill.

SIMPLEX Typewriters $3-$5; Remingtons $12.00; catalog 5c. Demeo, 114 Ford St., Prov., R. I.

TYPEWRITERS—All standard makes, $6 to $36. Fully guaranteed. Free trial. Free catalog. Typewriter Bargain House, Ada, Okla.

ALL makes, lowest prices, 5-year guarantee. Several specials. Free illustrated catalogue. Henry Typewriter Co., 217 West 125th St., New York, N. Y.

100 TYPEWRITERS Free. Overstocked. Rent Rebuilt Underwood or Remington $3.00 month. If you pay its value in rental, we give machine free. Particulars free. Pittsburgh Typewriter Exchange, 945 Hersch Bldg., Pittsburgh, Pa.

TYPEWRITERS, all standard makes. $10 up. Fully guaranteed. Free trial. Write for complete illustrated lists. Northwestern Typewriter Exchange, 121 N. Francisco Ave., Chicago.

TYPEWRITERS, Radios, Motorcycles $5 to $45. Knights, 1512 Locust, St. Louis, Mo.

PRINTING, ENGRAVING AND MULTIGRAPHING

"NEARGRAVURE"—"Neargravuremboss" "Litogravure" printed stationery, if particular. Samples, stamp. Sollidays, Knox, Ind.

CIRCULARS—3½x6, $2.50; 6x9, $4.00; folders, $5.25, thousand. Andrews, Box 1051, Fargo, N. Dak.

5,000 LETTERHEADS, $10.00, 20 lb. bond. Publications, catalogs big savings. Annville Printing Company, Annville, Pa.

250 BOND Letterheads, 250 envelopes, $3.00 delivered. Satisfaction guaranteed. Curtis, 811 Harrigan, Kalamazoo, Mich.

5,000 LOTS 3½x6 folders, $13.75; envelope slips, $5.00; 5½x8½ circulars, $10.00. Samples free. Christmas cards, colored embossed designs, paneled, name engraved style, 10, $1.00. Good's Printery, Harrisonburg, Va.

GOOD Printing pays. 100 envelopes, 100 full sized letterheads, bond paper, neatly printed, $1.25 postpaid; 500 each, $4.00. Write copy plainly. Samples. Peerless Press, Wytheville, Va.

200 HIGH-GRADE Bond Letterheads, Envelopes, $1.00; other printings. Ask for samples. De Toledo Printing Co., 455 N. 51st Street, Philadelphia, Pa.

100 PERSONAL Cards Printed, $1. Samples. Stanley Ladage, Camden, N. J.

12 CHRISTMAS Greeting Cards—Copperplate Engraved—your name on each card for only $1.00. American Printery, 83 Sheridan St., Wilkes-Barre, Pa.

RAISED Letter Printing, 100 6x7 Ripple paper, 100 envelopes, $2.00. Krafts, Ames Station, Omaha, Nebr.

CIRCULARS, 5,000—5½x8½—$11. 3½x6—4-page folders $14. All printing lowest prices. Samples. Garrison Press, Harrisonburg, Va.

500 WATERMARKED letterheads, noteheads or billheads $1.90. 1000 $3.25. Mirror, Gilmer, Texas.

MULTIGRAPHED Letters $1.75 Thousand. Samples. Profit, Box 1071B, Knoxville, Tenn.

250 LETTERHEADS and 125 envelopes, $1.50 postpaid. Commercial Printing Co., Allendale, S. C.

MULTIGRAPHING business correspondence, two dollars thousand. Hammermill letterheads, four dollars. Miscellaneous printing. Mayera Corporation, Monmouth, Ill.

250 BOND Letterheads, Envelopes, Billheads, Cards, $1.35 each. Economic Press, Leonia, N. J.

QUALITY Printing! Reasonable Prices! Send for Free Standardized samples and prices. Folders. Circulars. Catalogs our specialty. Earnest Fantus, 525 South Dearborn, Chicago.

PRINTED Personal Stationery. Ideal for Christmas Presents. Samples. Austin Press 722 Clifton Ave., Newark, N. J.

1,000—6½ WHITE envelopes printed, $2.35; 5,000—$8.85. Letterheads, 1,000—$2.95. Spors Printery, Lesueur Center, Minn.

$3.00 DELIVERED, 500 watermarked bond letterheads 8½x11 and 250 envelopes. Cash. Catalog free. Printing bargains. National Printing, Goshen, Ind.

PUBLISH Your Own Magazine or House Organ. Our standardized service at one-fifth ordinary prices. Samples and particulars free. Evans Printing Company, Grand Rapids, Mich.

DISTINCTIVE — Artistic Business Stationery that Creates Confidence. 1,000 Letterheads or Envelopes $3.00. Samples. Moulton Printing Company, 1410-P East 8th, Kansas City, Mo.

WE print Stationery, Booklets, Catalogs, Circulars. Samples. Commercial Press, Batavia, Ohio.

GUMMED labels, 500 name, address, 2 lines 35c. 3—55. Catalog. Eastern Label Co., B., Clintonville, Conn.

1000 BUSINESS Cards, Envelopes, or Letterheads, $3.00. 300, $1.00. 108 Eureka, San Francisco.

150 BOND Letterheads, 8½x11, and 150 Envelopes printed to order, $1.50; 100 Linen Calling Cards, 75c. J. Ferreira, 249 Eugenia St., New Bedford, Mass.

PRINTING—Stationery, Circulars, Booklets. Fine work; prices right. Battlefield Press, Gettysburg, Pa. Free battlefield souvenir.

200 LETTERHEADS and 100 envelopes, $1.00 postpaid. Oberman Company, Box 1268, Chicago.

PRINTING, OUTFITS AND SUPPLIES

PRINTING Presses, type, supplies. List 2c stamp. Bargains. Geo. Foster, 4342 North Robey, Chicago.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalogue. Model Press, York, Penna.

PRINT Your Own Stationery, cards, bookplate, Christmas cards, circulars, book, pamphlets, etc.; complete outfits, $8.85; larger, $11, $29 rotary $149. Print for others. Easy and interesting rules sent. Write for catalogue presses, type, paper, etc. Kelsey Company, K-11, Meriden, Conn.

GUMMED LABELS

1,000 PRINTED; Name, Business, Address, 50c. JBS Co., Box 93, Holyoke, Mass.

RUBBER STAMPS

RUBBER stamps!!! Name, address, two lines 35c; 15c additional line. 24 hour service. Mid-West Stamp Works, Forreston, Ill.

RUBBER Stamps—First line 15c; additional lines 10c. Newman & Son, Desk 44, Auburn, Neb.

ILLINOIS Rubber Stamp Works, manufacturers. Send for circular. 2913 No. Rockwell St., Chicago.

DUPLICATORS AND DEVICES

STENCIL Duplicator — $2.00 — Larger $3.00, $3.50, $4.00. Returnable. Samples. Circular. Primos Specialty Co., Primos, Pa.

STENCIL Duplicating machine (Postcard Size) prints 500 copies of postcards, blotters, notices, etc., with or without illustrations, for 15c. Simple, speedy, guaranteed. Sent on trial. Send for literature and actual samples of printing. Complete outfit $10.50. Keller Manufacturing Company, Pasadena, Calif.

YOU can make 50 to 100 copies of a letter, notice, etc., at a cost of three cents on a Heyer Quality Duplicator. Write for free trial offer. The Heyer Duplicator Co., 909 Jackson Blvd., Chicago, Ill.

ADDING MACHINES

NEW $3.50 Automatic Adding Machine. Adds, subtracts, multiplies absolutely accurate. Capacity $999,999.99. Fully guaranteed. 75,000 pleased users. Makes adding easy, positive, quick. Eliminates mistakes. Saves time. Postpaid $3.50. Bassett Co., 1458-H Hollywood Ave., Chicago.

FOR SMOKERS

HOMESPUN Tobacco—guaranteed, good flavor. Chewing, 5 pounds, $1; 10, $1.75. Smoking, 5 pounds, 75c; 10, $1.25. Pay when received. Farmers Union, Mayfield, Ky.

TOBACCO: Kentucky Sweetleaf. Smoking, Chewing, 15 pounds $2.25. Kentucky Farmers, Wingo, Ky.

FOR THE HOME

PHENOMENAL New Finish gives all the waterproofness and weatherproofness of Valspar yet dries in 30 minutes! In addition, Valspar Brushing Lacquer is amazingly durable and not easily scratched. Ideal for wood, metal and composition surfaces indoors or outdoors, especially where wear is hard and quick drying is desired. Anything you make or use about your home can be protected and beautified by a coat of Valspar Lacquer and be ready for use a few minutes later. Try it on furniture, toys, bicycles, radio apparatus, floors, trim, lighting fixtures—anything about the home, shop, office or farm. Send 25c for 45c sample stating color: Java Brown, Coral Sand, India Ivory, Nile Green, Palm Green, Italian Blue, Cardinal Red, Peacock Blue, Jonquil Yellow, Persian Lilac, Chinese Red, Oriental Green, French Gray, Holland Blue, Argentine Orange, also in Black, White and Clear. Valentine & Company, Dept. 4, 456 Fourth Avenue, New York, N. Y.

MEN! Women! Make $1 An Hour at Home, Weaving special-to-order Colonial Rugs on Union Looms. Big demand, no house-to-house selling, no store competition. You learn fascinating new craft in 30 minutes, we guarantee it. New looms at lowest prices ever. Liberal Pay-As-You-Weave terms. Write for Free Loom Book today. Union Loom Works, 480 Factory St., Boonville, N. Y.

DOES your radiator leak? Send 25c for trial package Stop-Leak. Canteen Oil Co., Box 212, R. R. 3, East St. Louis, Ill.

GRANDFATHER'S Clock Works. $5.00. Build your own case; Instructions free; make good profits selling your friends. Clock works with chimes for old or new cases. Write for full particulars. Clock Co., Ruffner St., Philadelphia.

CEDAR chests only $11.65—"Red-i-Kut" complete with rich copper trim—you assemble and save half—send for pictures. Kuempel Furniture Company, Guttenberg, Iowa.

FINE old maps and Colonial prints—the newest thing for lampshades or framing. Interesting catalogue 6c. Sea Arts Guild, 730-X Winnebago St., Milwaukee, Wisc.

WONDOR Sewing Board $2.00. Instructions 50c. Schryer, 5402 Train Ave., Cleveland, Ohio.

THAT Concrete Job. Don't be afraid to tackle it. With the instructions found in Popular Mechanics Concrete Handbook you can make 173 articles of utility and beauty ranging from ordinary steps to garden furniture. This book with our Home Mechanics Handbook that contains 329 helps about jobs that come up about the home will be sent for only 98c plus postage C. O. D. Send your order today to Popular Mechanics Press, Room 908, 200 E. Ontario St., Chicago, Ill.

HOW to Make and How to Mend. 1000 articles telling how to repair almost everything in use or needed about a home or farm. Many illustrations; formulas and trade secrets. Send no money. Just ask for "How to Make and How to Mend." Pay postman postal charges and $1.00. Popular Mechanics Press, Room 908, 200 E. Ontario St., Chicago, Ill.

THIS is the season for making repairs about the home. Easily done with instructions in our new book. Tells exactly how to use tools, sharpen tools and cutlery, repair furniture and cabinets, upholster, work metal, solder, work glass, paint, stain, varnish, hang paper, repair plumbing, furnace, electrical equipment, shoes, harness, gloves and concrete work. Send no money. Just write and ask for "The Practical Book of Home Repairs." When postman hands you the book, pay him $2.50 and the postal charges. Popular Mechanics Press, Room 908, 200 E. Ontario St., Chicago, Ill.

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WE Hollow grind and recondition old Razor Blades like new 12 for 30c or 4 dozen $1.00. Wm. Betken, 7740 Rhodes Ave., Chicago, Ill.

FREE—10,000 hollow-ground blades given away. Clean and save your blades, we buy and recondition blades, manufacturing commercial sharpening machines. Velvet Edger, 6001 Gramercy, Los Angeles, Calif.

GILLETTE Style Blades. Guaranteed new. Dozen 38 cents; 3 dozen $1.00. Wallace Kutz, 132 Chambers, Phillipsburg, N. J.

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DO you like to make things? If so, you should have a copy of Popular Mechanics new book entitled "Make It Yourself." A large book of 480-pages describing how to make 900 different articles, 823 illustrations. Price $3 postpaid. A full description will be sent upon request. Popular Mechanics Press, Room 912, 200 E. Ontario St., Chicago, Ill.

YOU Need a better grip on mathematics? Tell us to send you a copy of "Mathematics for the Practical Man," only $1.50. By common sense methods it removes the mystery and difficulties so algebra and calculus are made simple. Assuming your knowledge is limited to arithmetic you quickly and easily gain a working knowledge of algebra, geometry, trigonometry and calculus. Simply pay postman when he hands you the package. Address Popular Mechanics Press, Room 908, 200 E. Ontario St., Chicago, Ill.

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BUILD Your Own Boat using our Knock-Down ready cut materials. 55 models, outboard motor speedsters, runabouts, cruisers, sail, or row. Send 25c for catalog. Brooks Boat Co., Inc., Rust Ave., Saginaw West Side, Mich.

HUBBELL Marine Coolers convert Ford engines into marine motors. Booklet free. Ford speedboat, easily built, large blueprint and directions one dollar. C. C. Hubbell, Perry Ave., Norwalk, Conn.

PROPELLERS, Stuffing boxes, rudders, etc.; also used equipment bought, sold, exchanged. Wm. H. Baker, Pond St., Quincy, Mass.

NEW Boat Book telling how to make 21 kinds of boats. Also many other helpful ideas on boating. Profusely illustrated. With this we include the big book, "Outdoor Sports the Year Round." Directions for making all sorts of devices for outdoor recreation. Send no money. Simply pay the postman $1.98 plus postage when books are delivered. Popular Mechanics Press, Room 908, Popular Mechanics Building, Chicago, Ill.

SHIP Models—Worth while. Easy to make. Decorative Ships Picturesque Barbary Pirate Felucca and Beautiful Spanish Treasure Galleon (both 17th century). Instructions so simplified that any handy person can make these models with a few household tools almost without expense. No personal knowledge of ships or naval architecture required. New book only one of its kind. Pay postman $2.50 plus postage when book is delivered. Popular Mechanics Press, Room 908, 200 E. Ontario St., Chicago, Ill.

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ALL makes of Watches repaired by experts. Write International Watch Service, Box 5P, Fordham Station, New York.

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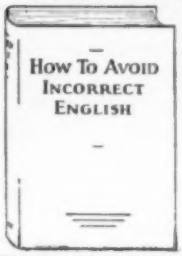

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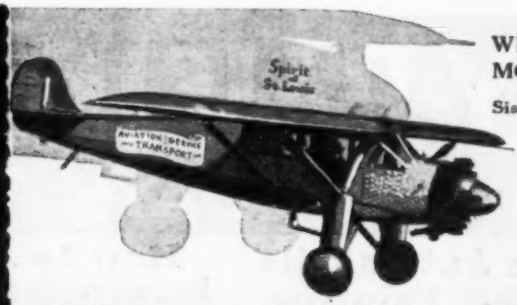

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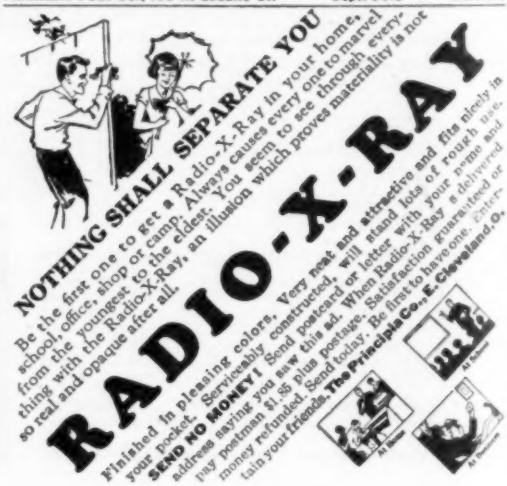

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Still, he felt that he was away above the average in mechanical brains. But he had no way to prove it even to himself. If he could only find some conclusive test—a private one—he knew he would be a changed man. Then he could "kill" that sub-conscious doubt that was making him "too backward." He would absolutely know, then, that study and work would bring him big success.

A Cigar and—

By a strange coincidence; when he stopped for a cigar that night, the druggist showed him a new pocket size, wood block PUZZLER.

He worked it for Harned, rapidly, once. "Now," he challenged Harned, "how long will it take you to solve it?"

"How long?" exclaimed Harned. "About a second. Why, man—you've just showed me how!"

"You're going to make a big discovery," said the druggist.

Late for Supper

Half an hour later Harned was still at it. The druggist smiled.

"Here," said Harned. "Sell me this. But I'll bet you a cigar I'll work it right after supper."

"Then you have the best mechanical brains in the world."

"How's that?"

"It's really a mental test. The latest craze in New York. One man, woman or child in a hundred thousand people may work it in half an hour. They are 100% mechanical geniuses."

How to Score

"Work it in three hours, for instance, and you score 97%. You lose 1% for every hour or fraction longer than the first half hour. Good brains may solve it in several days. Below the average people cannot solve it at all."

John Harned was delighted. Here was just what he had wanted. He would have two hours and a half after supper to score 97%. If he succeeded, he would be "too backward" no longer. IF—

Racing Time

After supper he told his family—made his young son timekeeper. John Harned worked. He studied. Never had time raced so fast.

Finally, his son told him he had five minutes more. Then four minutes. Three minutes. Wife and family gathered around him excitedly. He failed.

Fifteen minutes later he let out a great shout. "Solved!" 96%.

His son solved the PUZZLER in seven hours. His wife did it in ten.

But Harned's biggest delight came at the office, where everybody wanted to try the PUZZLER. The chief struggled with it fourteen hours. Best of all, Harned's enemy never could work it. It was all John Harned needed. The chief has boosted him twice since that.

Dad's Puzzler

is the name of the handsome, pocket size, wood block mental test with which John Harned found himself. Since then he has made a score of 83% with MA'S PUZZLER, and 91% with THE FLYING PUZZLER—both handsome, pocket size sequels.

Tremendous Popularity

When you can solve these PUZZLERS, you are "cock of the walk," the center of the crowd. A certain famous resort hotel man of the East entertains many jurists, big divines, actors. He does the PUZZLER for them once, then bets them fifty cents they cannot do it in half an hour. They all fail, laugh, snort, and refuse to be stumped.

A man holds the record. Twenty minutes. But perhaps you are a woman who can beat that.

Everybody wants them. More than a million have been sold in less than a year. A drug store next to Grand Central Terminal in New York has sold 35,000 in the last six months.

Christmas Presents

One—or a nest of three—make the Christmas remembrance of the hour. Cheap as engraved greeting cards, but different. More novel. People want them. Children of school age are wild about them. And they train young minds to concentrate.

Sold Everywhere

Many drug, novelty, tobacco, chain, book and department stores sell them now. Merchants may write for proposition, or they are stocked by Butler Bros., Liggett, and other large distributors.

If not in your town, order by mail. We send, postpaid, the introductory nest of DAD'S, MA'S and FLYING PUZZLERS, attractively boxed, with mental scoring card in each PUZZLER, for only $1.00. Clip coupon, enclose dollar bill or check. Mail NOW.

PUZZLER DEPT.,
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CAMBRIDGE SPRINGS, PA.

Enclosed find $.....for..... nest of handsome, pocket size, wood block MENTAL TESTS, which you will send postpaid.

Print Name.....

Address.....

City.....State.....

Each nest of three, $1.00. Any one PUZZLER, 50c, postage and packing included. If only 50c enclosed, send the pocket size mental test checked.

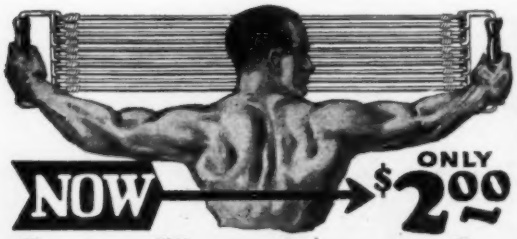
☐ DAD'S PUZZLER. Move largest block from upper to opposite lower corner. Open space in box only ¼ size of largest block.

☐ MA'S PUZZLER. Ma and her boy are separated by sickness, discouragement, no money, etc. Reunite them.

☐ FLYING PUZZLER. Hop off from New York and land in Paris in spite of storms, fog, air pockets, breakdowns, etc.

Everybody eventually buys all three. Better send the dollar now and save time and fifty cents.

DAD'S PUZZLER • MA'S PUZZLER • FLYING PUZZLER



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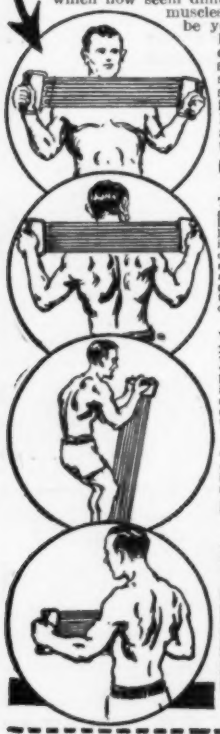

How the Giant Chest Expander and Progressive Exerciser Is Made

The Giant Chest Expander and Progressive Exerciser is made with new live, springy rubber so as to give it long wearing and great resisting qualities. Do not pay more for an exerciser that has forty or less rubber strands to each cable. Get the best and most durable. The Giant Progressive Exerciser has **50 strands** of the finest rubber procurable to each cable.

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Check the Exerciser you want, and it will be sent you by return mail. Pay postman introductory price, plus few cents postage on arrival. It is understood that if you are not entirely satisfied with your exerciser you may return it within 5 days and get your money back.

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City.....State.....

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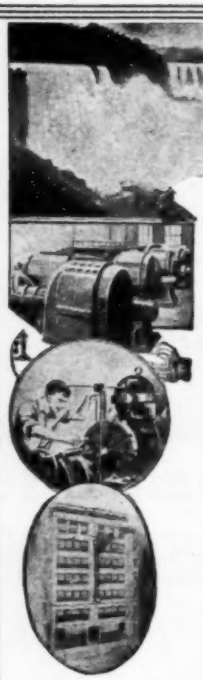

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of Popular Mechanics Magazine, published monthly at Chicago, Ill., for October, 1927. State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, Jr., who, having been duly sworn according to law, deposes and says that he is the editor and business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit: First. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 200 East Ontario St., Chicago, Ill. Editor, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Managing Editor, L. K. Weber, 200 East Ontario St., Chicago, Ill. Business Manager, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Second. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) L. B. Windsor, 200 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Third. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. Fourth. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. H. H. WINDSOR, Jr., Editor and Business Manager. Sworn to and subscribed before me this 28th day of September, 1927. J. GRAHAM, Notary Public. (My commission expires June 17, 1928.)

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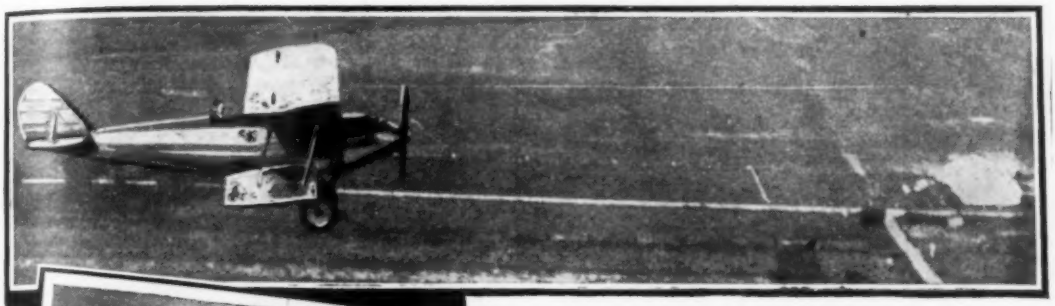
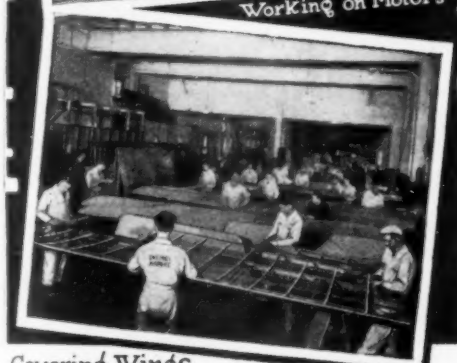


Fuselage & Assemble

Working on Motors



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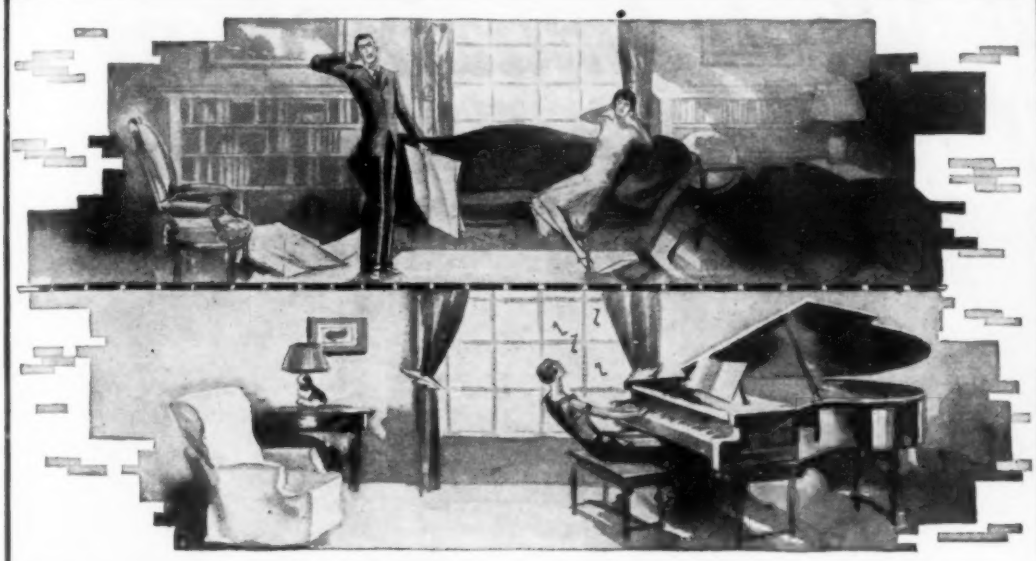

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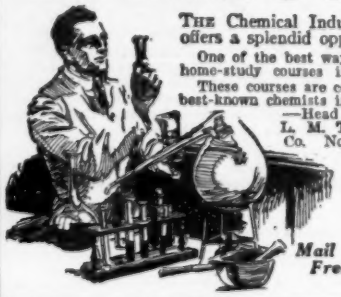

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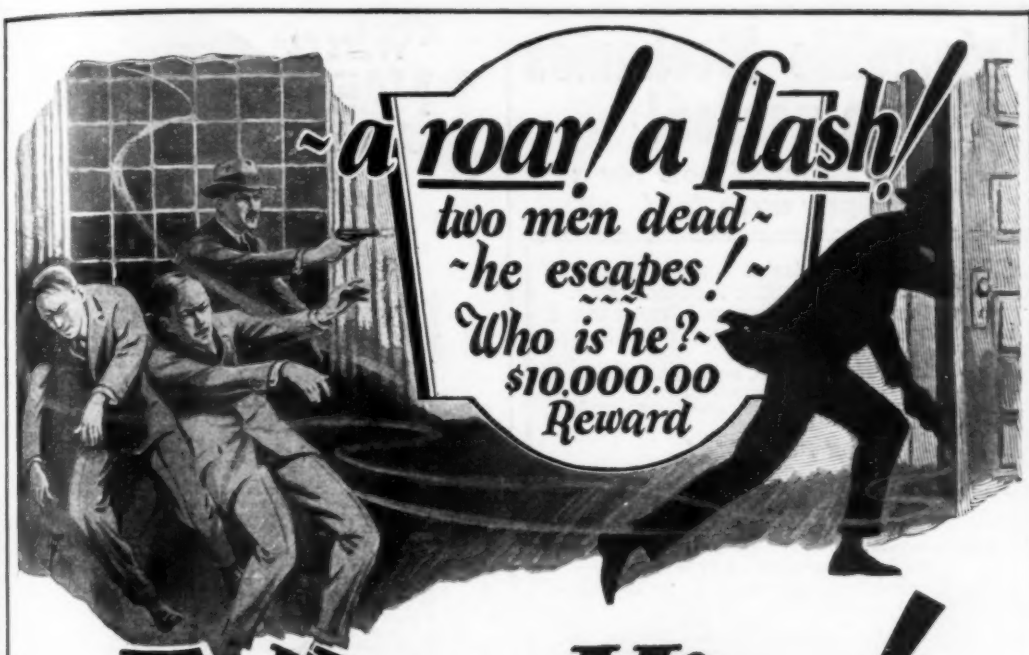

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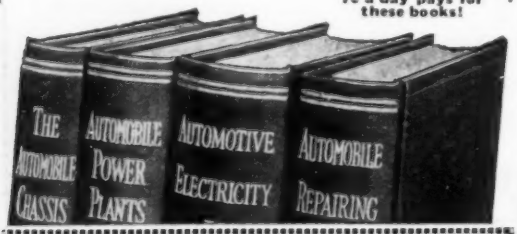

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., Inc., 370 Seventh Ave., New York

Send me for 10 days' free examination the New Practical Automobile Library. If satisfactory, I will send you $1.50 in 10 days and $2.00 monthly until the special price of $13.50 is paid. If not wanted, I will return the books at your expense.

Signed.....

Address.....

City and State.....

Position.....

Employer.....P. M.—12-27

Win a NASH Sedan

or $1400.00 in cash

Someone who answers this ad will receive a fully equipped De Luxe Model Nash Sedan, or full value in cash if preferred ($1,085.00). In addition to this Nash Sedan we give away, a latest model Chevrolet Coach or its cash value ($595.00), a Brunswick Panatrope Phonograph, a Six Tube, Single Dial Freshman Radio, a Corona Portable Typewriter—many other valuable prizes and Hundreds of Dollars in Cash.

14
1
19
8
19
5
4
1
14

Solve This Puzzle

The numbers in the squares to the right spell two words. The alphabet is numbered. A is 1, B is 2, C is 3, etc. Can you make out what the two words are? When you do this, send me your answer right away. It may mean winning the Nash Sedan or $1,400.00 in cash.

$315.00 Cash For Promptness

In addition to the two automobiles, the many other valuable prizes and Hundreds of Dollars in Cash, we are also offering a Special Prize of $315.00 in Cash for Promptness. First prize winner will receive $1,400.00 in cash, or the Nash Sedan and $315.00 in cash. In case of ties duplicate prizes will be awarded each one tying. Get busy right away. Solve the puzzle and send me your answer together with your name and address written plainly. EVERYBODY REWARDED. Address

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Name.....

Address.....

Employed by.....

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"ASPA" WANTS YOU

As a Member of

AMERICA'S GREATEST AIR SOCIETY

The American Society for Promotion of Aviation was organized by 12 ex-service aviators at the Army and Navy Club, New York City, in 1925.

Our objects as incorporated are to "arouse and maintain interest in aviation" and eventually to

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We can accomplish our objectives by having a landing field or air port in every town, and by training red-blooded Americans in the art of flying.

FLYING CLUBS WILL BE ORGANIZED IN EVERY COMMUNITY.

THIS WORK ENDORSED AND SUPPORTED BY AMERICA'S LEADING AIRMEN.

You can participate in this great movement by becoming a member of THE A. S. P. A., and, as our representative, work for aviation in your community.

Join Aviation's Great Fraternity—ENROLL NOW!!!

MEMBERSHIP *fee ONE DOLLAR which covers the cost of silver wings, membership card and literature of the A. S. P. A.*

Silver Wings Actual Size

Secretary, The ASPA
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New York City, N. Y.

Yes, I am interested in aviation! Please enroll me in the American Society for Promotion of Aviation. I enclose membership fee of One Dollar. Please send me my wings.

Name..... Dept. X

Address.....

City..... State.....

BOYS

Drawn from actual photograph of student doing spare time electrical work

Learn Electricity Make Big Money

How would you like to earn two or three dollars every evening after school and prepare yourself for a fine big job at the same time? Here's the opportunity of a lifetime for you fellows who like Electricity. Begin right now to prepare yourself for a regular man's size job in this fascinating field. Your chances for a big success are simply wonderful—the pay is big (thousands of men earn $70 to $200 a week) and advancement comes swift and sure.

I Will Train You at Home

With my easily learned, spare time Electrical Course I will train you at home like I have trained hundreds of other boys who are now big successful men. It will not interfere with your school work and you can earn more than the small cost of the course doing odd electrical jobs in your spare time. The Course pays for itself. I will show you how to get this work and how to do it. Some of my boy students make $10 to $15 a week this way.

Tools, Apparatus and Radio Course —Given Without Extra Charge

Send me the coupon below and I will tell you all about the big outfit of tools, apparatus and instruments and a new Radio Course that I am giving to my students for a limited time. I will send you my big interesting Electrical Book and a sample lesson, too—all **Free**. You will be tickled with the things I will send you Free. Mail the coupon right now.

L. L. COOKE, Chief Instruction Engineer

L. L. Cooke School of Electricity
Dept. O19 CHICAGO

Look What This Boy Is Doing

"Although the School term is coming to a close, and I am pretty busy with my examinations, I manage to keep up with my electrical studies and work.

"I guess, I forgot to tell you I am now in business for myself. Am doing fine, but owe it all to you. If it had not been for your Course, I, being under age, could not have secured my license in this town. But I got it, and now have all the work I cando, averaging $20 to $30 a week, thru spare time work.

"I went out on a job tonight after school, on which I made $3 and brought home another on which I made $2.50—$5.50, for 4 hours' work and no material furnished by me."

ROGERS SMITH,
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Use This "FREE BOOK" Coupon

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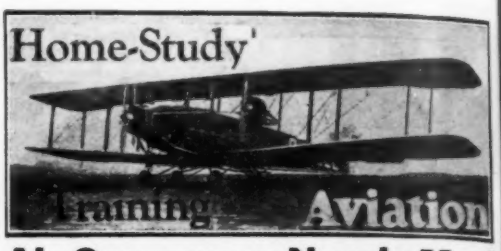
L. L. Cooke School of Electricity,
Dept. O19 2150 Lawrence Avenue, Chicago

Send me your big Electrical Book, Sample Lesson and particulars of your Electrical Course and Extra Radio Course. This will not obligate me in any way.

Name .....

Address .....

This Coupon only for use of boys 15 years old or more.



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The champion muscle-making Exerciser of the world! Develops GIANT muscles in 30 days. Big, powerful cables made of genuine live Para rubber. Your choice of 5, 10 or 15 cables. Satisfaction GUARANTEED. Money back if you can match it at THREE TIMES the price.

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Address .....
City ..... State .....

☐ Check here for C.O.D. shipment. Post extra.

Men Wanted in Auto Trades

Battery and Ignition Dept.

Young man, if you are mechanically inclined, this is the most important month of your life. Now is the time when you should come straight into the Sweeney Auto School and learn in a few short weeks the automobile trades and fit yourself for a sure-fire big pay job doing work you like. You can send for a catalog but that isn't necessary. 70,000 men have gone through this school and you can just write or wire when you are coming and all will be ready for you. Don't worry about previous experience or any scholarship; no experience is necessary and we have even made good mechanics out of men who could barely read or write. We teach with tools, not books. Right now you want to know all about the NEW FORD CAR and thousands of jobs are open for men who can handle the new Ford. You will learn this at Sweeney's. Many old mechanics now coming in for this special work. Yes, my EMPLOYMENT DEPARTMENT helped L. W. Kelley to a **job at $18.00 A DAY**—IT helped J. H. Miller to a **job at $10.50 A DAY**—IT helped Gordon Shyrock **to a job at $10.50 A DAY**, and it, also, is helping dozens of other Sweeney Graduates to fine jobs at $10 to $18 a day. IMMEDIATELY after finishing ONLY A SHORT COURSE OF SWEENEY TRAINING.

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Teaches by practical, personal experience. You work with tools, not books. You learn by doing. Million dollar school with complete equipment. You need no previous experience. If you are looking for success in life and working at a trade you like write me today. Drivers, mechanics, repair men, testers, garage owners, painters, welders, demonstrators—thousands more are needed and opportunities are everywhere. If you are mechanically inclined simply send name today for my big free book how to fit yourself for steady high paid employment in the auto business.

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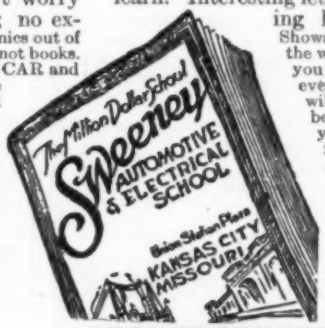

E. J. SWEENEY
President

To save time, write or wire when you'll arrive and we'll be looking for you! No need to delay—Just come along!

EMORY J. SWEENEY, President
4431 Sweeney Building, Kansas City, Mo.

Send me free, without any obligation, your catalog and Special Offer!

NAME.....

P. O.....

STATE.....AGE.....

This illustration shows the main building of the McCleary Sanitarium and Clinic at Excelsior Springs, Missouri—the largest institution in the world devoted to the treatment of piles and other rectal troubles. (Only curable cases are accepted.)

A Serious Affliction Cured Without Surgery

THE old theory that piles can be cured only by surgery has been wholly disproved. This treacherous affliction which slowly but surely undermines the health of its victims can be cured—totally and successfully—without the dangers of a surgical operation.

Patients From All Parts of United States and Canada

For 27 years, Dr. A. S. McCleary and his associates have made an exhaustive study of rectal diseases. During that time, more than 13,000 patients from all parts of the United States, Canada and foreign countries have been successfully cured. Scores of these had been given up as incurable and many others were chronic cases of long standing.

Absolute Relief or No Pay

No matter how long you have been troubled—

No matter how distressing your case may be—

No matter how many treatments you have had without avail, if your case has not been neglected so long as to be incurable, we can promise you absolute relief or no pay.

If you or any of your relatives or friends are interested, we will gladly mail you our free book, "Piles Cured Without Surgery." This book fully describes the McCleary methods of diagnosis and treatment of all rectal troubles, and tells you exactly what is offered here at a very nominal cost.

The McCLEARY CLINIC and SANITARIUM

254 Elms Boulevard
EXCELSIOR SPRINGS, MO.

McCleary Clinic and Sanitarium
254 Elms Blvd., Excelsior Springs, Mo.

Please send me book fully describing the McCleary Method of Treating Piles Without Surgery.

Name.....

Street Address.....

Town or City.....State.....

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New invention bringing big profits to agents. Herrick made $157 in one day showing new way to save gasoline and end carbon trouble. Unique demonstration plan brings sales quickly on proved results. National advertising helps you. Over two million now installed. Fits any car, truck or tractor.

FREE! To introduce in every locality, inventor will send samples to car owners and distributors. No sale if it doesn't show results. Write for details to J. A. Stransky, W-10 Stransky Block, Pukwana, S.D.

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WHEN our VACUUM CAP is used a few minutes daily. We accept no pay until you have tried the Cap 60 days and are satisfied. The Vacuum Cap is an appliance that draws the blood to the Hair Roots and starts a new healthy crop of hair. It stops Dandruff, stops the hair from falling out. Bought by Doctors and men who know that it is the only reasonable HAIR GROWER known to science. No Drugs Used. Write for application blank, testimonials and booklet on "HAIR," sent sealed in plain envelope, FREE.

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STUART'S PLAPAO-PADS are different from the truss, being mechanico-chemico applicators made **self-adhesive** purposely to hold the distended muscles securely in place. **No straps, buckles or spring attached**—cannot slip, so **cannot** chafe or press against the pubic bone. Thousands have successfully treated themselves at home without hindrance from work—most obstinate cases conquered. **Soft as velvet—easy to apply—inexpensive.** Awarded Gold Medal and Grand Prix. Process of recovery is natural, so afterwards no further use for trusses. We **prove** it by sending Trial of Plapao absolutely **FREE**. Write name on Coupon and send **TODAY.**

PLAPAO CO., 733 Stuart Bldg., St. Louis, Mo.

Name.....

Address.....

Return mail will bring Free Trial Plapao.

Button Rupture Newest Way

[Without Pressure]

I take pleasure in informing you through the use of the New Science System my rupture is entirely relieved. At the time I ordered your System I had been ruptured 20 years.

M. P. Brumbaugh, Juanita, Pa.

I am writing to let you know that my rupture does not trouble me any more and I think in a little while it will be gone. Your appliance has all you claim for it. Before I got it I could work only part of the time. Now I can do almost anything.

Mrs. C. W. De Long, Gilboa, N. Y.

SCIENCE now advises discarding cruel steel springs, barbarous leg straps, and other harness that press against the rupture and thus prevent nature from healing it. A new sensible method has been perfected, after thousands of test cases, called Magic Dot—entirely different from any other way. Instead of "pressing" it "seals" rupture, and of course allows users to run, jump, bend and cough in perfect safety.

Breathes Air

With this 1-25th oz. device is a new kind of pad, air-porous and washable. It actually breathes air, and cannot slip off the rupture—a feature, you'll frankly admit, that is lacking in your present appliance. In fact, it is so superior and different that it is praised by physicians as "an entirely new departure." Users report they have forgotten they are wearing it. But don't buy it yet.

See It First

By a special arrangement you can now have it sent to your home without obligation to wear it. Don't send a penny or order it now. Just mail the coupon for full description of "Magic Dot" and details of this unusual offer. Act now for quick relief. Write your name and address on the coupon and mail it today!

NEW SCIENCE INSTITUTE

2143 Clay St. Steubenville, O.

New Science Institute,
2143 Clay St., Steubenville, O.

Please send me free your illustrated book and sample of Airtex. Include also your offer which permits me to see the New Science System without cost or obligation.

Name.....

Address.....

City.....State.....

"How I got the job that 34 others were seeking"

THIRTY-FIVE men applied for the position as Advertising Manager of a big department store in New Orleans. But Sam D. Reeks was selected above all these other men because he was trained.

He says: "My I. C. S. course enabled me to put my facts before the proprietor of this business in such a way as to prove that I knew what I was talking about. I was just as well equipped to discuss his advertising with him as if I had been at the work for years and years."

Mr. Reeks was given the position—and he made good in a big way after he got it—because his International Correspondence Schools course had prepared him to take advantage of his Opportunity when it came. Just a few years ago he was elected president of the Advertising Club of New Orleans—another tribute to his personality and ability.

Why don't you study, as Mr. Reeks did, and prepare to get a better position and a larger salary? You can do it if you really try.

At least make the start by marking and mailing the coupon printed below and find out what the I. C. S. can do for you. It doesn't cost you a penny or obligate you in any way to get the facts, but that one simple little request may be the means of changing your whole life. **"Do it now."**

Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 5689-E, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, **"Who Wins and Why,"** and full particulars about the course *before* which I have marked X in the list below:

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- ☐ Nicholson Cost Accounting
- ☐ Bookkeeping
- ☐ Private Secretary
- ☐ Spanish ☐ French
- ☐ Salesmanship
- ☐ Advertising
- ☐ Better Letters
- ☐ Show Card Lettering
- ☐ Stenography and Typing
- ☐ English
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- ☐ Mechanical Draftsman
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- ☐ Civil Engineer
- ☐ Surveying and Mapping
- ☐ Metallurgy ☐ Mining
- ☐ Steam Engineering
- ☐ Architect
- ☐ Architects' Blueprints
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ Chemistry ☐ Pharmacy
- ☐ Automobile Work
- ☐ Airplane Engines
- ☐ Agriculture ☐ Navigation
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Name.....

Street Address.....

City..... State.....

Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

DOUBLE PROFITS

$544.00 IN A MONTH

With Amazing New "TWIN" INVENTIONS

Here's something startling, new! A revolutionary "Twin" plan of selling that pays men everywhere double profits. So read the Free Test Offer Below. Then act!

One of the most sensational chapters in the history of direct selling has been written in the past 4 months! For, almost incredible as it may sound, in that short time over 2,000 men have discovered the secret of **double profits** on 4 out of 5 sales.

TWIN INVENTIONS—NEEDED EVERYWHERE

This unique plan is made possible by two revolutionary patented inventions. A new kind of can opener, absolutely automatic, holds the can, cuts the top out (not off) inside the rim, leaving it smooth, slick and clean—all in a couple of seconds at the turn of a crank—ends forever all stabbing and hacking with old-style can openers. A twin invention, an equally revolutionary knife, scissors and tool sharpener—operating on new, patented "magic groove" principle—sharpens automatically at a twist of the wrist.

$544.00 First Month

"Speedo sells to 9 out of 10 prospects. Here's the result of my first month's work. June 13—60 Speedos; June 20—84 Speedos; June 30—192 Speedos; July 6—288 Speedos."
M. Ornoff, Va.

Every home feels an instant need for at least one of these amazing new devices. Four out of five buy **both** because of unique interchangeable feature, both operating from same tiny wall bracket. There is not room for all the sensational details here. Our plan includes practical sales training course. We furnish everything. Exclusive territories. Write today for Free Test Offer and proof of $68 to $150 a week.

CENTRAL STATES MFG. CO.

Dept. W-701 4500 Mary Ave. St. Louis, Mo.

CENTRAL STATES MFG. CO., Dept. W-701,
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Rush me details of your double profits plan and Free Test Offer.

Name.....

Address.....

Town..... State.....

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I have trained thousands of men to be auto and tractor mechanics, and I can train you. 8 weeks is all it takes. No previous mechanical experience necessary. Very little schooling required. With my simple, practical, work-while-you-learn methods anyone can quickly fit himself to go into the auto and tractor business or work for others at big pay. Hundreds of McSweeny trained men are making $75 to $125 a week. And there is room for thousands more. Big pay jobs all over the country are begging for skillfully trained men.

This is Your Opportunity to get out of the rut and learn a trade where you can make real money. Write at once for my big special Fall and Winter tuition offer which includes

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I am prepared to handle thousands of students this season and I am making the most liberal offer you ever heard of. You'll be surprised how little it will cost to fit yourself for a big pay job. I promise you satisfaction or money back. After you have completed my course, if you are not satisfied that I have done everything possible to fit you for a big job, I'll refund your tuition. Hurry! Mail the coupon now. Get liberal tuition offer and details of **electrical course** FREE.

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of extra cost
General Electrical Course
House wiring, armature winding, motor work and all general electrical training. Both alternating and direct current work.

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I want to send my big, beautifully illustrated auto book FREE to every man who is interested in a better job and bigger pay. Tells all about my training methods and big opportunities in auto and tractor repairing.

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Without cost or obligation, send me your big FREE book on Autos; also, full details of your big offer including R. R. Fare and Board Paid, and FREE electrical course.

Name.....

Street.....

Town.....State.....

MC SWEENY AUTO, TRACTOR and ELECTRICAL SCHOOLS

Dept. 11-T-2 CINCINNATI, OHIO; CLEVELAND, OHIO

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Under Lieut. Walter Hinton
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Learn Watchwork, Jewelrywork and Engraving A fine trade commanding a good salary, and your services always in demand. Address **Horological,** Dept. P, Bradley Institute, PEORIA, ILLINOIS, for our latest catalog.

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TEACH YOURSELF in half usual time, at trifling cost, with the wonderful Automatic Transmitter, **THE OMNIGRAPH.** Sends unlimited Morse or Continental messages, at any speed, just as an expert operator would. **Adopted by U. S. Government, and leading Universities, Colleges and Telegraph Schools. Catalog 6 cents.**

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MEN 18 TO 45
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$141.67 to $275.00 Month

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(No connection with U. S. Government)
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Rush to me, WITHOUT CHARGE, (1) Your 32-page Illustrated Book. (2) Send full particulars on how to get a position as City or Rural Mail Carrier at $141.67 to $275.00 a month.

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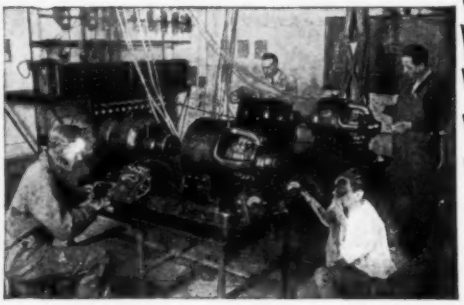
Address.....

Learn Electricity in Los Angeles



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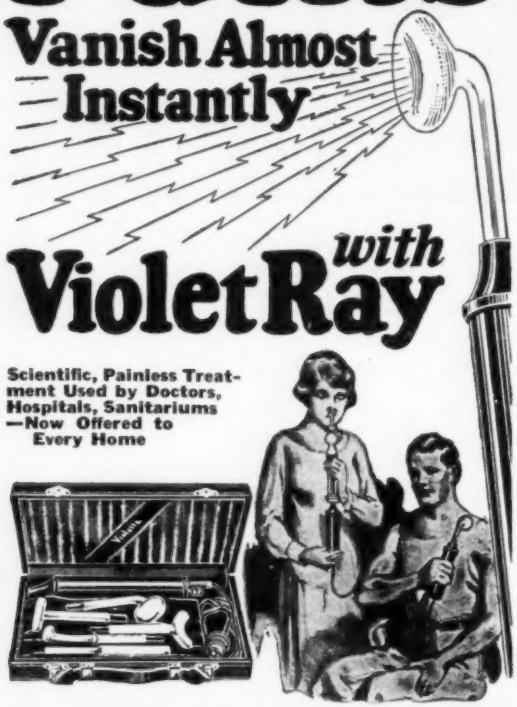

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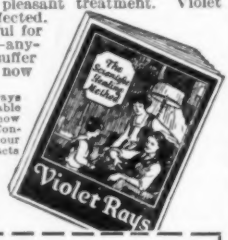

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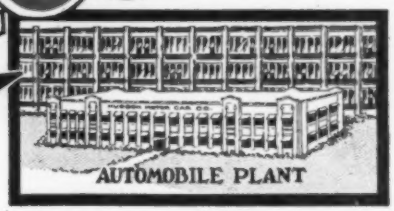

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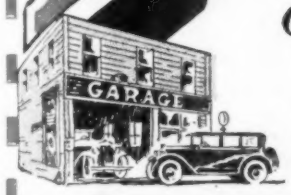

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They are aiming at *big jobs*—aiming at big business! *And they get it!* Our graduates of a few years ago now are Service Managers, Superintendents—owners of their own shops—managing bus or truck transportation—or climbing high in aviation, that great new branch of the motor industry.

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Look at the facts square in the face, Mr. Tobacco User. You may think tobacco is not hurting you.

That is because you haven't as yet, perhaps, felt the effects of the nicotine poison in YOUR system. For **you** know that nicotine, as absorbed into the system through smoking and chewing tobacco, is a slow working poison. Slow, yes—but **sure.**

Tobacco is lowering your efficiency. It slows a man down. Makes it harder for you to concentrate your mind on your work. You haven't near the amount of "pep" and energy you would have if you stopped using it. There's many a man twice as old as you in years who's twice as young in energy, simply because he lets tobacco alone.

Some day you will realize to what an alarming extent tobacco has undermined your system.

When your hands begin to tremble—
and your appetite begins to fail—
and your heart seems to "skip a beat" now and then—
and slight exertion makes you short of breath—
then you have a right to suspect that
TOBACCO is getting the upper hand.

Any well-informed doctor will tell you that these are only a few of many symptoms of tobacco poisoning.

And **YOU** know that the use of tobacco in **any** form is an **expensive,** utterly useless habit. You know you **ought** to quit.

Tobacco Habit Banished

Let Us Help You

It doesn't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it—whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—**Tobacco Redeemer** will positively remove all craving for tobacco in any form in a very few days. Not the slightest shock to the nervous system. Your tobacco craving will usually begin to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is marvelously quick, scientific and thoroughly reliable.

It is in no sense a substitute for tobacco. After finishing the treatment you have absolutely no desire to use tobacco again or to continue the use of the remedy. It helps to quiet the nerves and make you feel better in every way.

Results Guaranteed A single trial will convince you. Our legal-binding, money-back guarantee goes with each full treatment. We will refund every cent you pay for the treatment if after taking it according to the easy-to-follow directions, it should fail to banish the tobacco habit completely.

SEND Coupon for Free Proof Let us send you our **free** booklet on the deadly effects of tobacco, together with testimonial letters from men all over the country telling how they have been absolutely freed from the tobacco habit by this simple home treatment. You could not ask for stronger proof that **Tobacco Redeemer** will free you from the habit than the evidence we will gladly send on request. Just mail the coupon—or a postal will do.

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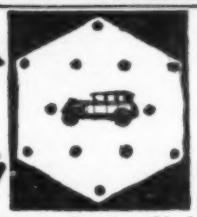

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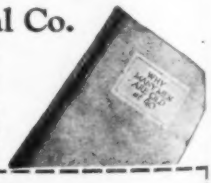

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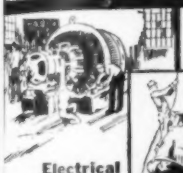

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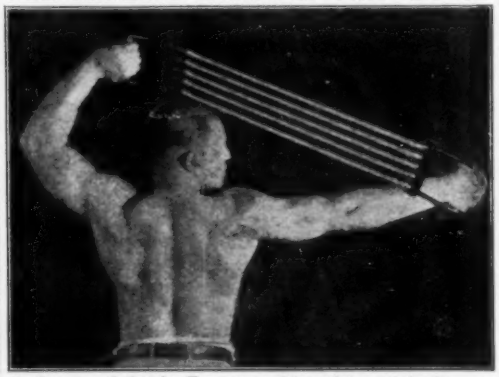

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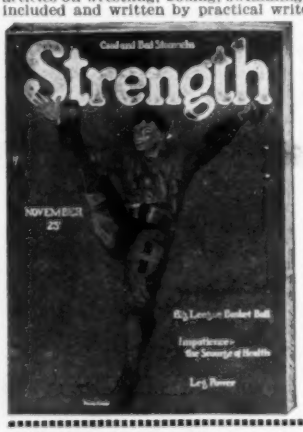

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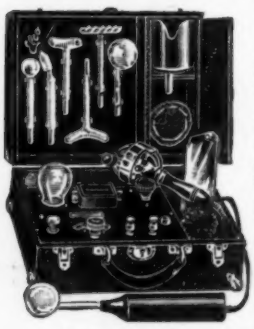

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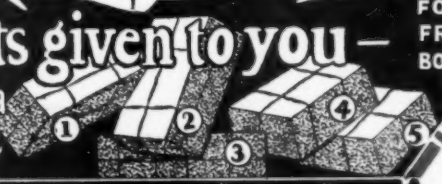

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Aviation is **ready**,—the miracles of success made in the auto business by men who looked ahead, are now about to be repeated in the new, great Business of Aviation. Pilots are needed, ground men are needed, skilled mechanics, transport managers, etc. Come to Detroit the Aviation Center and get the training for success and big money in this new business. Learn at the "Michigan State," world-famous trade school. Thorough, practical training in either ground work or flying, or both. Qualifies you to pass government examinations.

MICHIGAN STATE AVIATION SCHOOL
Affiliated with Michigan State Automobile School
Established 17 Years A. G. ZELLER, Pres. 3712 Woodward Ave., Detroit, Mich.

Get the Facts TODAY

A. G. Zeller, President
Michigan State Aviation School
3712 Woodward Ave., Detroit, Mich.

Send me at once the details of your Aviation Ground and Flying Course. I expect to come to Detroit about.....

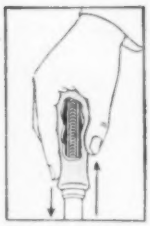
Name.....

Street and No. or R. F. D.....

City and State.....

Drive Screws the Quick, Easy Way

Up or Down is the same to this world-famous "Yankee" Spiral Screw-driver.



The Live Spring in the Handle makes "Yankee" No. 130-A the Quick-Return Spiral Screw-driver.

One-handed you can quickly drive (or draw) screws in tight places.

Use "YANKEE" No. 130-A

Wherever there is a hard screw-driving job — that's where you want "Yankee" Quick-Return Spiral Ratchet Screw-driver No. 130-A. For, in any position, driving screws is surprisingly easy and speedy.

The live spring in handle keeps blade in screw slot, and brings handle back ready for the next push—without a second's loss. Just push! The Spring and "Yankee" Spiral do the work for you and save your time. The long reach prevents barked knuckles.

Right-hand Ratchet, Left-hand Ratchet and Rigid. Three sizes of bits. No. 130-A, standard size; No. 131-A, heavy pattern; No. 135, light pattern. Without the Quick-Return feature, No. 30-A, No. 31-A, No. 35.

"YANKEE"

Christmas Suggestions

No. 1530—Ratchet Hand Drill
No. 1435—Two speed Hand Drill
No. 41—Automatic Push Drill
No. 1555—Ratchet Breast Drill
No. 90 or 95—Plain Screw-drivers
No. 1992—Vise with Swivel Base
No. 2100—Ratchet Bit Brace
No. 10 and 15—Ratchet Screw-drivers
No. **130-A**—Spiral Screw-driver

Dealers Everywhere Sell "Yankee" Tools

"Yankee" on the tool you buy means the utmost in quality, efficiency and durability.

North Bros. Mfg. Co. Philadelphia, U. S. A.

"YANKEE" TOOLS

Make Better Mechanics

FREE
"Yankee" Tool Book for all lovers of fine tools. Write for it.

How many are 421,000 stockholders?

An Advertisement of the American Telephone and Telegraph Company

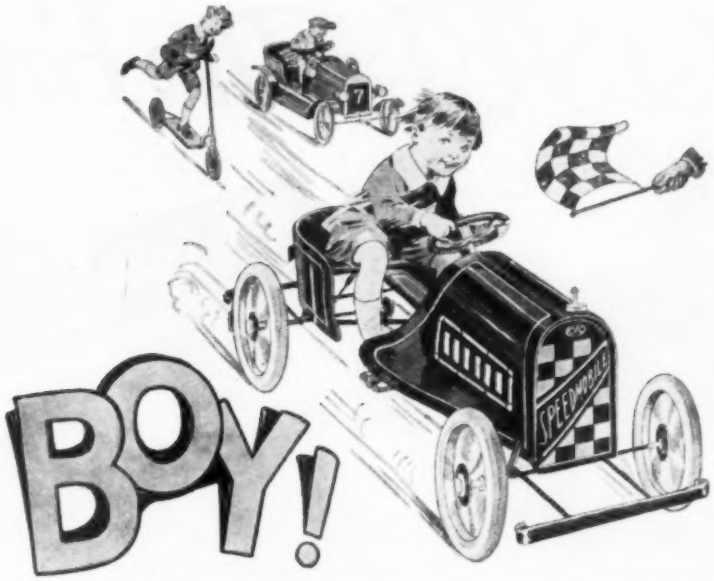
On October 15th, American Telephone and Telegraph Company checks representing the 152d dividend were mailed to its 421,000 stockholders. That is the largest number of stockholders of any company in the world.

The American Telephone and Telegraph Company is owned by a great investment democracy.

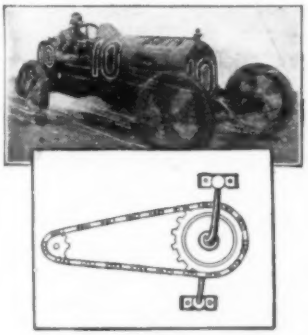
Its dividend checks are cashed at banks in every state in the Union, by people representing all trades, stations and professions.

No institution is more nationally or publicly owned than the American Telephone and Telegraph Company, which in turn owns more than 91% of the common stock of the operating companies of the Bell national System. The average holding is 26 shares, and no one person owns as much as 1% of the total stock.

The Bell System was developed in the interest of telephone users and is owned by the public that it serves.



This wonderful new SPEEDMOBILE
makes you a faster racer than you ever dreamed!



CHAIN DRIVE
like famous racing cars

THE new Speedmobile chain drive is the greatest improvement ever made in boys' automobiles. It has a chain sprocket like famous racing cars with bicycle-type rubber cushioned pedals. It's a cinch to win with this new snappy racer. It is adjustable for boys from 4 to 10 years old.

YOU'LL leave the bunch way behind when you step into this speedy little racer. The Speedmobile boy is always the envy of the neighborhood.

This shiny red speedster has real class. It is built just like an honest-to-goodness racer, slung low, balloon tires and everything. Not only is it a winner as a racer but it coasts too. Simply keep the pedals still and let 'er go! Has the famous patented "Speedorcoast" sprocket, that speeds ahead, reverses, brakes and coasts.

SAFE *because under control*

THE Speedmobile has double precautions for safety. Besides an emergency brake the boy's feet are always free to act as brakes because his legs aren't enclosed by side boards. The chain is guarded too, so he can't possibly catch his legs or clothes in it.

Send for FREE *racing poster*

THIS poster tells you all about famous races and drivers; about the "Sunbeam," the fastest car in the world; and other interesting things about automobiles. Send the coupon now for your free poster. It will tell you how to conduct a thrilling Speedmobile race yourself. Children's Vehicle Corporation, Dept. F-1, East Templeton, Mass.

$19.75
West of the Mississippi $21.50

CHAIN CVC DRIVE
SPEEDMOBILE
"FASTEST JUNIOR BUILT"

MAIL THIS COUPON

CHILDREN'S VEHICLE CORPORATION,
Dept. F-1, East Templeton, Mass.

Please send me a free copy of your Racing Poster

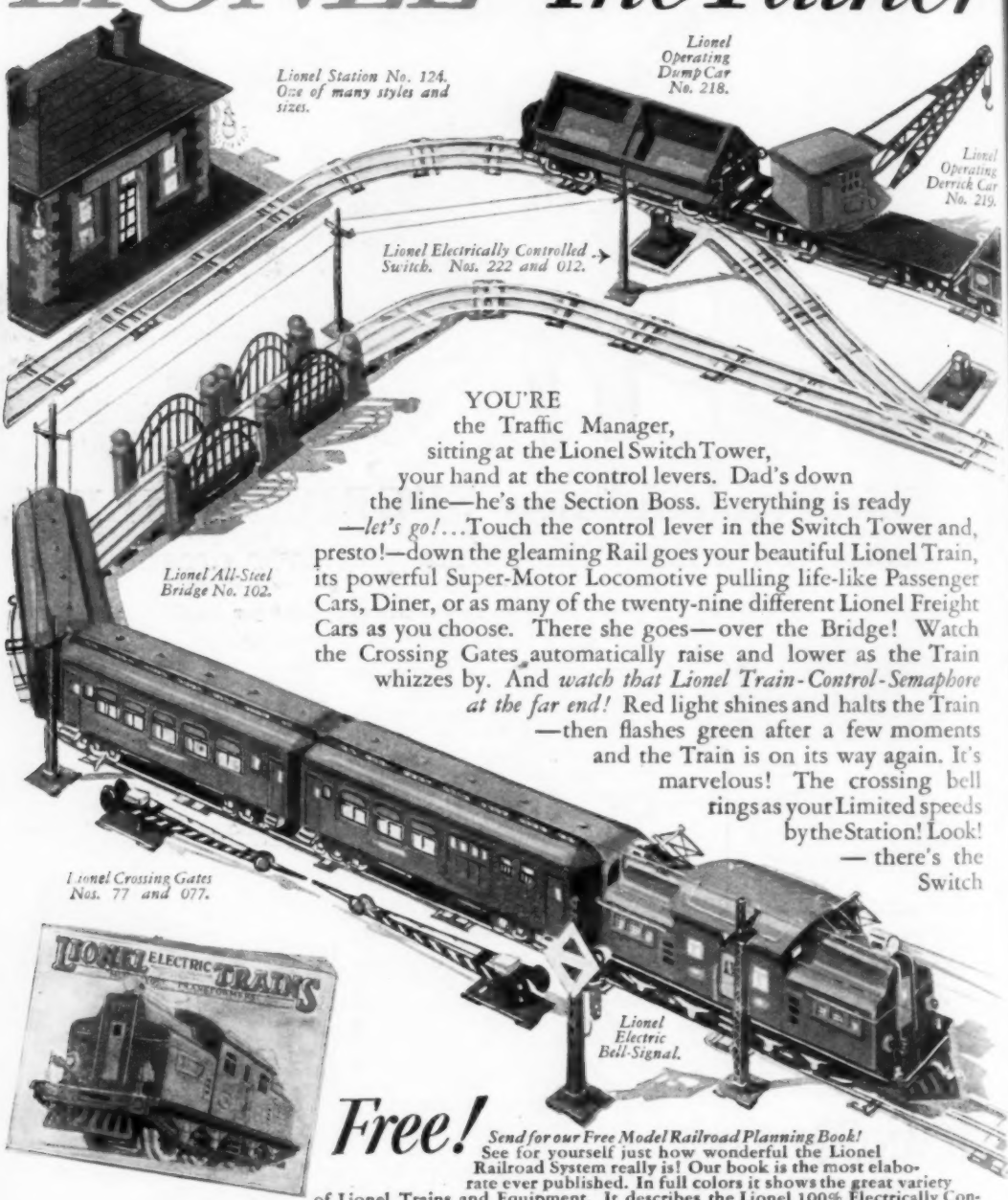
Name.....

Street.....

City.....*State*.....

I am.....*years old, going on*.....*years.*

LIONEL—The Father



YOU'RE the Traffic Manager, sitting at the Lionel Switch Tower, your hand at the control levers. Dad's down the line—he's the Section Boss. Everything is ready —*let's go!*...Touch the control lever in the Switch Tower and, presto!—down the gleaming Rail goes your beautiful Lionel Train, its powerful Super-Motor Locomotive pulling life-like Passenger Cars, Diner, or as many of the twenty-nine different Lionel Freight Cars as you choose. There she goes—over the Bridge! Watch the Crossing Gates automatically raise and lower as the Train whizzes by. And *watch that Lionel Train-Control-Semaphore at the far end!* Red light shines and halts the Train —then flashes green after a few moments and the Train is on its way again. It's marvelous! The crossing bell rings as your Limited speeds by the Station! Look! — there's the Switch

Free!

Send for our Free Model Railroad Planning Book!
See for yourself just how wonderful the Lionel Railroad System really is! Our book is the most elaborate ever published. In full colors it shows the great variety of Lionel Trains and Equipment. It describes the Lionel 100% Electrically Controlled Railroads for "0" Gauge and "Lionel Standard" Track. This great 46-page book shows the supreme quality and built-in excellence of all Lionel Products. Sets from $5.75 to $300. Send for the book today!

"STANDARD OF THE WORLD SINCE 1900"

LIONEL ELECTRIC TRAINS

MODEL RAILROAD ACCESSORIES

"MULTIVOLT" TRANSFORMERS

and Son Railroad

—real enough for a man to enjoy—simple enough for a boy to operate.

ahead.
Back in the Switch Tower you touch another lever—the Track-Switch is thrown, the Train glides into a Siding—touch another lever and the Train stops. But—wait! You are building a freight yard down the line. You call to Dad—he couples on the new Lionel Derrick Car with operating boom and tackle, and the new operating Dump Car filled with sand! Again you touch a lever—your Train backs out onto the main line. Throw the Switch again and she's off on her way! Just think! You can do all this at any distance from the track...It's amazing—almost magical—the way a Lionel Railroad operates. So real!—*all* the Equipment, Locomotives, Cars, Stations, Semaphores—*everything* is real! The only difference between Lionel Trains and real trains is the size. See Lionel Products demonstrated at the leading department stores, toy, hardware, electrical, sporting goods and furniture stores.

THE LIONEL CORPORATION

Dept. G
15-19 E. 26th St., New York, N.Y.

Set No. 904
12 tools—oak cabinet
Price $15.00

The three most important Xmas questions

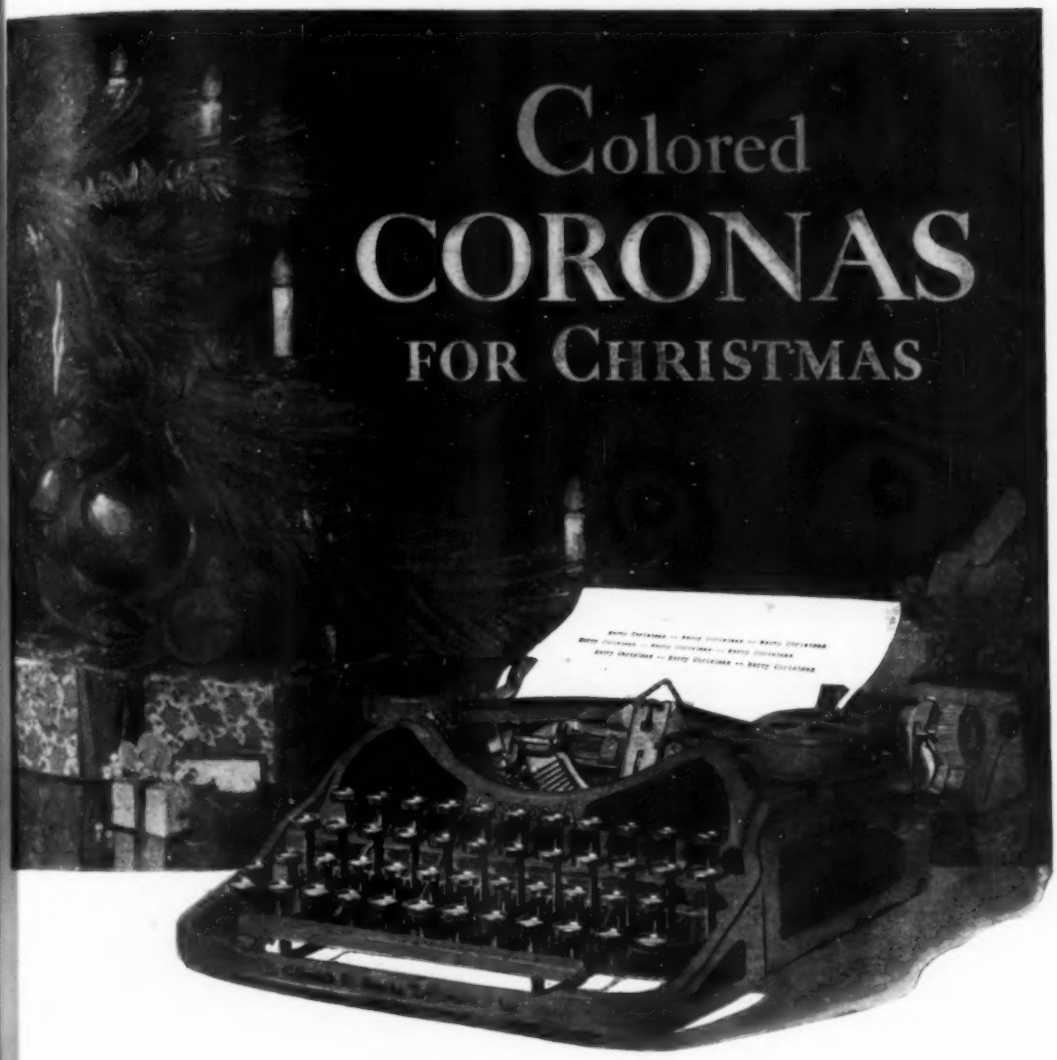
They are: (1) What gift gives the most lasting pleasure? (2) What gift offers most for the money? (3) What gift is offered at a range of prices that permits selection according to the amount you wish to spend?

These three questions are answered by Stanley Tool Sets. Stanley Tools are known the country over as the most complete line of fine woodworking tools. Stanley Catalog Sd35 shows 18 Tool Assortments costing from $5 to $95. Your hardware dealer has these sets or can easily get them. Ask him for Catalogs Sd35 and Sd50. If he cannot supply you write us for free copies. The Stanley Works, New Britain, Connecticut.

Set No. 907—7 tools in cardboard box—Price $5.00. This set includes plans for making a tool cabinet.

Set No. 902—20 tools—oak chest
Price $25.00

STANLEY TOOLS



WHAT a delightful Christmas gift! Corona, the finest portable typewriter money can buy, finished in durable Duco to blend inconspicuously with the color scheme of your room, or to lend a vivid spot of contrasting color.

There is a color for every taste—red, green, maroon, blue, cream, lavender. All metal parts not finished in Duco are either brightly nickeled or given a satin finish. No care has been spared to make this the most beautiful typewriter ever built.

Write us for illustrations of Duco finished Coronas in actual color, or if convenient, stop in at the nearest Corona store.

L C Smith & Corona Typewriters Inc

Sales offices in principal cities of the world Established 1903 1212 E. Washington Street, Syracuse, N. Y.

Also manufacturers of the L C Smith Typewriter, the Ball-Bearing Office Machine

As lean and as fleet as a greyhound—the Sargent Auto-Set

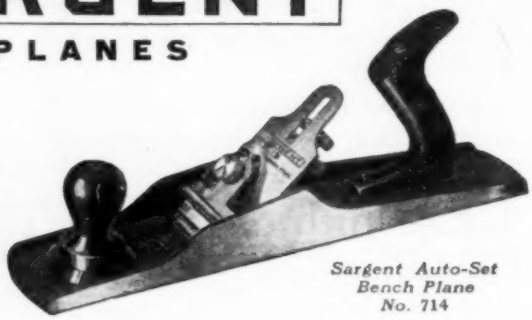
THERE's not one gram of excess weight on the Sargent Auto-Set Bench Plane. It's the ideal tool for the home or school work bench. There's an exclusive feature which permits the chromium steel cutter to be removed, sharpened, and put back in a jiffy—right where it was, without disturbing the original adjustment. This feature is a time and trouble saver, as any of the many carpenters and wood-workers who use the modern Auto-Set will tell you. The Auto-Set is handsome, roomy around the grips for freer handling, and lastingly built.

For the smaller jobs or for use in close quarters you couldn't own anything better than the Sargent Steel Block Plane. It is small, but mighty sturdy and dependable. Ask your dealer to show you these long-lasting economical planes and write to us for free booklet. Sargent & Company, *Manufacturers*, 49 Water Street, New Haven, Conn.

SARGENT

PLANES

Sargent Steel Block Plane No. 5206



Sargent Auto-Set Bench Plane No. 714

7 Tube Set
Single Dial Radio

30 DAYS FREE TRIAL

Metrodyne Radio Sets
Are Equipped For
BATTERY or ELECTRIC operation

The Metrodyne
ONLY ONE DIAL TO TUNE

Retail Price $75.00
COMPLETELY ASSEMBLED
BIG DISCOUNTS to Agents and Dealers

Wonderful offer direct from the factory! The world's greatest radio! A perfect working, single dial control, 7 tube receiver! And just to prove our claims, we will ship it to your home for **30 days' free trial.** Test it under all conditions. Test it for distance, volume and tonal quality—and if you are not convinced that it is the **best single dial set** you ever heard, return it to the factory. We don't want your money unless you are completely satisfied.

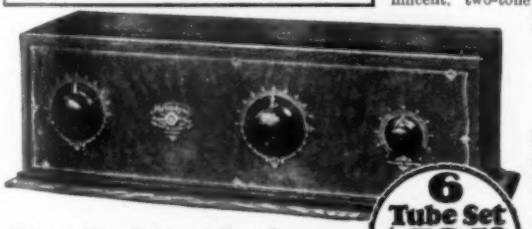
BIG PROFITS TO AGENTS AND DEALERS

Our Agents and Dealers make big money selling Metrodyne Sets. You can work all or part time. Demonstrate the superiority of Metrodynes right in your home. Metrodyne Radios have no competition. Lowest wholesale prices. Demonstrating set on 30 days' free trial. Greatest money-making opportunity. Send coupon, letter or postal for our agent's proposition.

Three Year Guarantee
Metrodyne Super-Seven Radio

A single dial control, 7 tube, tuned radio frequency set. **Tested and approved by Popular Science Institute of Standards, Popular Radio Laboratory, Radio News Laboratory and by America's leading Radio Engineers.** Designed and built by radio experts. Only the highest quality low loss parts are used. Magnificent, two-tone walnut cabinet with beautiful, gilt metal trimmings. Very newest 1928 model.

Easiest set to operate. Only one small knob tunes in all stations. The dial is electrically lighted so that you can log stations in the dark. The volume control regulates the reception from a faint whisper to thunderous volume, **1,000 to 3,000 miles on loud speaker!** The Metrodyne Super-Seven is a beautiful and efficient receiver, and we are so sure that you will be delighted with it, that we make this liberal **30 days' free trial offer.** You to be the judge.



6 Tube Set $48.50
RETAIL PRICE
Completely Assembled

30 Days' Free Trial—3 Year Guarantee
Metrodyne Super-Six

New 1928 model Metrodyne 6 tube, two dial, long distance tuned radio frequency receiver. Approved by leading radio engineers. Highest grade low loss parts, completely assembled in a beautiful walnut cabinet. Easy to operate. Dials easily logged. Tune in your favorite station on same dial readings every time—no guessing.

Mr. Howard, of Chicago, said: "While five Chicago broadcasting stations were on the air I tuned in seventeen out-of-town stations, including New York and San Francisco, on loud speaker, loud and clear."

We are one of the pioneers of radio. The success of Metrodyne sets is due to our liberal 30 days' free trial offer, which gives you the opportunity of trying before buying. Thousands of Metrodynes have been bought on our liberal free trial basis.

Mail COUPON Below!
Let us send you proof of Metrodyne quality—our 30 days' free trial offer and 3 year guarantee

MRS. WM. LEFFINGWELL, WESTFIELD, N. J., writes: "The Metrodyne Radio I bought of you is a wow! This is as good as any $225 machine I have ever seen."

N. M. GREENE, MAYWOOD, ILL., writes: "My time is up and the Metrodyne works fine. I got Havana, Cuba, Oakland, Calif., Denver, Colo., Toronto, Canada, all on the loud speaker."

J. W. WOODS, LEADVILLE, COLO., writes: "Received the 7-tube Metrodyne in fine condition. Had it up and working same day received. Was soon listening to Los Angeles, San Diego, Oakland and other California points; also St. Louis, Kansas City and other east and south stations—all coming in fine. Am more than pleased. Sure enjoying it."

We will send you hundreds of similar letters from owners who acclaim the Metrodyne as the greatest radio set in the world. A postal, letter or coupon brings complete information, testimonials, wholesale prices and our liberal 30 days' free trial offer.

MAIL THIS COUPON
or send a postal or letter. Get our proposition before buying a radio. Deal direct with manufacturer—SAVE MONEY—WRITE NOW!

METRO ELECTRIC COMPANY
2161-71 N. California Ave., Dept. 45, Chicago, Illinois

METRO ELECTRIC COMPANY
2161-71 N. California Ave., Dept. 45, Chicago, Ill.
Gentlemen:
Send me full particulars about Metrodyne 6 tube and 7 tube sets and your **30 days' free trial offer.**

Name.....

Address.....

.....

If you are interested in AGENT'S proposition, place an "X" in the square ☐

What About Your ALCOHOL This Winter ?

The ZeroMeter

Takes the worry out of winter driving. A permanent instrument. Install one now!

Is a constant and accurate check upon the amount of alcohol present in the cooling system of your car. Always working.

TOO MUCH alcohol is sheer waste, for it evaporates out on the first mild day.

NOT ENOUGH alcohol means a frozen radiator and cracked cylinder block.

JUST RIGHT means economy and no worry,—"The ZeroMeter Way."

The all aluminum ZeroMeter makes a handsome attachment on any car. Easily installed on the radiator hose by any one. Saves its cost in alcohol. Once installed, it can be taken apart in a moment—without affecting the water in the radiator.

—SENT ON APPROVAL—

Fill in the coupon below and get a ZeroMeter on approval. If you are not satisfied with it, your money will be refunded.

CHRISTIE-COUSE CORPORATION
2928 Migel Pl., Bronx, N. Y.

Please send me a ZeroMeter on approval. I will pay the postman $3.50 and postal charges on receipt of the Meter. I can return the Meter within 10 days and my money will be refunded.

Name .....

Street and No. .....

City ..... State .....

(Please print)

☐ Sent postpaid if $3.50 check or money order is enclosed.

☐ Canada, $4.00 postpaid.

Get Ready to Join a Harmonica Band!

YES, you can learn to play as well as the next fellow. All you need is a Hohner Harmonica, our free instruction book, and a little practice — and first thing you know, you'll be reeling off the tunes like a veteran!

Pretty soon you'll be looking round for some other chaps to join you in a harmonica band—and that's when you'll really appreciate what fun there is in being able to play this "miniature orchestra."

There are harmonica contests, too, in which thousands of boys take part—and some mighty handsome prizes waiting for those who win!

The NEW *Way to Learn*

A special orthophonic Victor Record (No. 20377) "How to Play the Harmonica" is now available for those who wish to learn by listening to the living voice of the instructor, and following the notes as they are sounded on his harmonica. Illustrated instruction sheet also included. Reverse side reproduces "Old Black Joe" as rendered on harmonica with piano accompaniment. At all dealers selling Victor Records . . . . complete 75c

FREE Instruction Book

Anyone can learn to play the harmonica by following the clear, simple, illustrated instructions given in our booklet "How to Play the Harmonica." Free at your dealer's — or write to M. Hohner, Inc., Dept. 508, 114 East 16th Street, New York.

HOHNER Harmonicas

The *Only* Electric Engine You Can *Take Apart and Rebuild*

It's a Dorfan Loco-Builder—the fastest and most powerful electric engine made. Think of the fun there is in being able to take apart your engine and put it together again! How this develops skill and a genius for things mechanical and electrical. This "Take-apart" feature is found only in Dorfan electric engines. Dorfan engines and trains are handsome and powerful—copies of famous transcontinental flyers! Thousands of American boys say—*"there's no train like the Dorfan!"* Priced from $6.00 to $38.50.

Ask your dealer today for a catalog. If he does not have the new catalogs yet, send us his name and he will receive a supply for you and your friends. THE DORFAN COMPANY, 137 Jackson Street, Newark, New Jersey.

DORFAN

TAKE-APART ENGINES

ELECTRIC TRAINS

IF YOU CAN USE AN EXTRA $20.00 BILL

write for this

FREE BOOK

You can save $20.00 in no time by using

SMOOTH-ON No. 1

to do your own household repairing—and in addition you will have that proud "I-did-it-myself" feeling.

Here is what one enthusiast did with two 35 cent cans:—A $25 lamp stand loose in base, two big leaks in heating furnace smoke pipe, loose hammer handle, and three loose hooks in tiled bath room wall were all put into good usable condition at an average cost of 10 cents each for the seven repairs—and $20.00 easily saved over what would have been paid to professional fixers or for new parts.

By using Smooth-On to make dozens of the simple repairs necessary in every home, you can save enough to pay your radio upkeep, buy yourself or your wife a camera, a bull pup or some other pleasure-giving article that you would otherwise hate to spend the money for.

The free Smooth-On Repair Book will show you how an astonishing number of home and automobile repairs are as easy for you to make as for somebody else, also how you can make cellar walls, concrete floors, etc., water and damp proof with Smooth-On No. 7.

Mail the coupon for a free copy and get Smooth-On No. 1 in 7-ounce or 1 or 5-pound can from any hardware store.

SMOOTH-ON MFG. CO.
Dept. 37, 574 Communipaw Ave.
JERSEY CITY, N. J.

Do it with SMOOTH-ON

SMOOTH-ON MFG. CO., Dept. 37,
574 Communipaw Ave., Jersey City, N. J.

Please send the free Smooth-On Repair Book.

Name.....

Address.....

12 **Return this coupon for a**
27 **FREE copy of Booklet**

Ranks High!

New Model

Pocket Ben

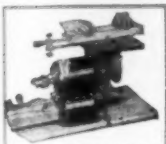
The New Model Pocket Ben ranks high among good watches. That's because it combines good looks with correct time-keeping.

Sold everywhere for $1.50. With night-and-day dial $2.25.

Built by the makers of Big Ben and other Westclox

WESTERN CLOCK COMPANY
La Salle, Illinois

Here is the workshop you have been waiting for! The DELTA Handi-Shop, a practical outfit for practical work. Big, sturdy, oversize attachments and accessories, and plenty of them. A trial will prove its true value.



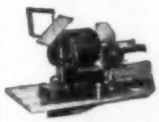
Cutting groove with dado head, either straight or at an angle, with table raised for depth of cut. It's easy with the Delta Handi-Shop.

The famous New Model "American Giant" Scroll saw, 12-inch throat cuts up to 1½-inch thick. (Patented August 21, 1923.) Table tilts 45 degrees to left, 15 degrees to right.

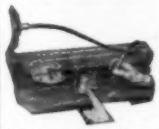
Different? SURE!—Here's Why—

Cutting a 1-inch by 12-inch board at an angle. No interference, floor and ceiling are only limits to length of board handled.

Sanding proper draft on pattern, and sizing and squaring electrotype — two of the many possible operations with this attachment.



Showing special frame for holding real fine jewelers blade for delicate marquetry, jewelers or inlay work. Takes standard 5-inch long jewelers blades. Note table is tilted fully 45 degrees to the left. Blade is always securely supported by hardened guide underneath table, an exclusive Delta feature.



Showing small flexible shaft attachment. Note the delicate work possible. Uses standard burrs, easily obtainable everywhere.

WE set out to produce a really practical and efficient work shop. After long and careful study and experimenting, we scrapped all of the old, conventional designs and ideas, and decided upon using a sturdy, quiet-running motor of special design, **with two shaft extensions**—right there we had a valuable feature that offered unusual, and practically unlimited possibilities.

While the much-used Circular Saw is driven from one shaft, the Lathe, with its many attachments, can be driven from the other shaft. There are always two tools ready for work and easily controlled by a conveniently placed switch. Simply throw off the Special Rubber V-belt and the saw is disconnected. In a jiffy any one of the many **full-sized,** sturdy, practical accessories is in place and you are ready to go. Simple, isn't it? You never saw anything so easy—so quick—so convenient as the interchanging of attachments. You must try it to thoroughly appreciate its many advantages—its outstanding superiority.

The Delta Handi-Shop consists of the following—all specially designed—all sturdily built from the finest materials obtainable.

MOTOR—Specially designed ¼ H. P. fully enclosed, 1750 R. P. M., constant speed, **with two shafts.**

LATHE—has capacity of 9-inch diameter by 24 inches. (Can be furnished up to 36 inches at small additional cost.) Steel bed of 4-inch U-Section—will not chatter or spring. Ballbearing Tailstock, 4-inch face plate, spur center, cup center, and wide and narrow tool supports.

Lathe Attachments—6-inch diameter, fast-cutting emery wheel, adapter flange, 6-inch buffer, 5-inch wire brush, all of finest quality—all oversize. ⅜-inch capacity Jacobs chuck that fits both motor and tailstock spindles; two turning tools.

Sanding Attachment—8½-inch diameter "Man Size" sanding disc. Takes standard sheet of sand paper. Novel design sanding table 5-inch by 12-inch, tilts 45 degrees down, 10 degrees up. An exceptionally valuable and useful attachment, quickly attached and easily adjusted.

Flexible Shaft—Can be furnished in two sizes, with hand pieces to take standard burrs. Ideal for carving, metal pattern and die work, etc.

Make these beautiful things, and hundreds of others; there is practically no limit to the work the DELTA HANDI-SHOP will do.

NOW—Give Yourself a Treat!

Make all those wonderful, attractive things you want around the house. Develop your ideas and inventions. Get started in business—earn money on full or spare time. Let the DELTA HANDI-SHOP be your never-failing and faithful servant. Lack of space does not permit a full description here, so act now—send for it and judge for yourself.

10 Days FREE Trial

A small down payment brings this *complete* workshop to you. Use it. Do those unusual things that only Delta Handi-Shop can do. You can do even the simple things easier and quicker, too. Let us send you our beautiful, illustrated folder that describes in detail every novel feature of the DELTA HANDI-SHOP. See how much you get for so modest an outlay of money.

Mail Coupon NOW!

FREE Blue Prints

DELTA SPECIALTY CO.
Dept. MP-1227—858 3rd St., Milwaukee, Wis.

Send me your Illustrated color folder describing Delta Handi-Shop. Tell me about your Free Trial offer and easy payment plan.

Name.....

Street Address.....

City..... State.....

Dry-Permanent Radio Power!

No Acids, Liquids or Charging Bulbs

No watering or other attention!

KUPROX "A" TRANSIFIERS—Batteryless, noiseless, electric "A" power. Dry, dependable, needs no attention. Operates any receiver. 4-volt or 6-volt, $28.50 and up.

KUPROX Radio Power Devices make any set entirely electric!

Now, no more of the bother and worry of batteries ... none of the troublesome watering and attention. KUPROX is absolutely dry ... all metal ... it requires no watching or watering .. no attention of any kind. Simply install KUPROX Radio Power Devices on your set and forget them. A mere snap of a switch gives you all the power you need without a bother of any kind.

Your radio dealer has the complete line of KUPROX dry Power Devices, from trickle chargers to the mighty A & B Combination Models that supply all radio power from a single compact unit.

KUPROX A & B TRANSIFIERS—All radio power from a single unit. Controlled from set switch. Absolutely dry, requires no attention. $57.50 and up.

[FREE BOOKLET FOR YOU: "The Secret of Successful Battery Elimination," describing KUPROX Devices, will be mailed free on request. Write for it.]

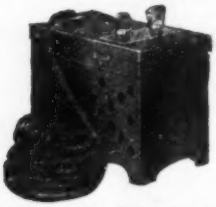
THE KODEL RADIO CORPORATION, 517 E. Pearl St., Cincinnati, O.

KUPROX

RADIO POWER DEVICES

KUPROX "B" TRANSIFIERS — Dry, permanent, free of hum. Guaranteed voltage at rated output. Models for all sets and circuits, $14.50 and up.

KUPROX REPLACEMENT UNIT—For replacing the acid jar on all standard trickle chargers and power units. Eliminates all watering and attention. $4.50.



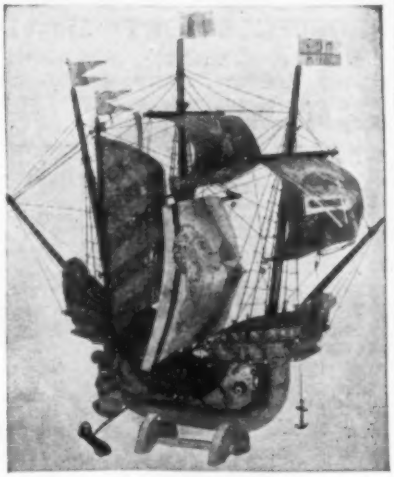
KUPROX TRICKLE CHARGERS — Absolutely dry; 1-amp. rate. Large model gives 2½-amp. booster charge. $10.50 and $18.50.

BUILD YOUR OWN SHIP MODEL

CONSTITUTION
Size: **30" high; 32" long; 10" wide (overall)**

You can build a beautiful Ship Model as low as $4.98 or a Loud Speaker Ship Model for $12.50 with your own hands in a few hours of pleasant pastime from parts, cut to fit and ready to assemble, supplied by the largest builders of ship models in the world.

A fifteen year old school boy won first prize in a model building contest with a Constitution model built from our kit of parts. More than 1,000 models were entered in this contest.



LA PINTA
A Ship Model Loud Speaker. Size: 26" high; 27" long; 12" wide (overall)

We will supply the parts for the Constitution (Old Ironsides) cut to fit and ready to assemble for $6.98. This price includes every part necessary for constructing the complete model. Full instructions for assembling Old Ironsides are included with each kit. A diagram of parts, showing the number of the parts and just exactly how to piece together the model, make it impossible for you to make a mistake. Other beautiful ship models can be built from our cut to fit and ready to assemble parts. We have kits for the Santa Maria, the La Pinta and the Mayflower at $4.98 each.

This is the most beautiful loud speaker on the market. We will supply you with all parts necessary and complete instructions for building this beautiful loud speaker ship model. The price of $12.50 also includes the melody sail and loud speaker unit. The unit is of the Electro Magnet type and does not require power amplification to bring out the low notes as it gives faithful reproduction at all frequencies. The mainmast is deeply imbedded in the solid wood hull and the unit is attached to this mast, making it impossible for counter-vibrations to affect reproduction.

A Useful and Ornamental Home Decoration

No doubt you have often admired ship models and yearned to possess one but could not do so because the price was too high. Let the WORLD'S LARGEST BUILDERS OF SHIP MODELS AND SHIP MODEL LOUD SPEAKERS supply you with all the necessary parts, cut to fit and ready to assemble from which you can build a beautiful model.

You need not know anything about ship building or carpenter work in order to build one of these ships. No special knowledge of ship model building is necessary either. We will supply all the parts, from the hull down to the smallest piece, all cut to fit and ready to assemble. You cannot go wrong. Diagrams and plans of parts that are included with each kit tell exactly what to do with each part.

These plans show you step by step just how the model is constructed. Everything is made so simple that even a small child can build a beautiful model.

All you need is a small hammer to tap the parts into place. Here is a part of the instructions copied word for word from the diagram and instruction sheet that goes with the kits. "Take part No. 57, place it in front end of part No. 56 and tap lightly with a hammer. Next take part No. 58 and place it up against No. 57 and tap it with a hammer to bring it into place."

MINIATURE SHIP MODELS, Inc.
3818-20-22-24 Baring St., Philadelphia, Pa.
Canadian Branch: 1485 Bleury St., Montreal, Canada

Canadian Prices Slightly Higher. Send all Canadian Orders to Canadian Office

Easy! Nothing simpler. The instructions are like that from beginning to end. Do this and that and before you realize it a beautiful ship model has grown before your eyes.

Write for our free, beautifully illustrated catalog, which contains photographs of all our models together with complete details and price of each. We will send this catalog without obligation to you. Fill in the coupon below and we will act upon it immediately.

If, after assembling the model according to our instructions, you do not think it worth many times the purchase price, return it to us in good condition and we will gladly refund your money.

MINIATURE SHIP MODELS, Inc., DEPT. P3
3818-20-22-24 Baring St., Phila., Pa.

Please send me complete parts, cut to fit and ready to assemble for the Constitution, $6.98 ☐; Santa Maria, $4.98 ☐; La Pinta, $4.98 ☐; Mayflower, $4.98 ☐. Melody Ships: La Pinta, $12.50 ☐; Santa Maria, $12.50 ☐; Mayflower, $12.50 ☐. I will pay postman purchase price plus postage (a few cents). Check which model you want shipped.

PLEASE PRINT NAME AND ADDRESS PLAINLY

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The special polished points and sponge in cap make the points write as smooth as a lead pencil, looks and writes like a $7 pen. Cannot blot or clog, ideal ruling pen. No dull season. Money refunded if not pleased.

PROSPECTS WORTH $15 A DAY TO YOU!

Business men, students, professional men, stenographers, teachers, merchants, salesmen, farmers, bookkeepers, and express agents, in fact anybody that writes, is a prospect.

SELLS FOR $1.25

AGENT'S SAMPLE **65¢**

IDEAL XMAS GIFT, COMES IN HOLLY BOX

The pens come in 8 assorted colors, ladies' or men's style.

FREE

Handsome roll, pen case with your first order of $6.42 worth of our famous Spors pens.

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No. 311. Drop forged steel.
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WHOLESALE SAMPLE **20¢**

Indestructible La Paree Pearls

FREE! UPON REQUEST this large wholesale specialty catalog, showing over 300 fast selling specialties, from many parts of the world.

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F. SPORS & CO.

1027 Main St. Le Sueur Center, Minn.

Hello boys!

Send for this free book which tells all about my NEW 1927 ERECTOR

with these sensational new features

1—Complete Unit Control (New assembled Trumodel Construction equipment parts)
2—New Erector Trumodel 3 Drum Hoist
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6—Erector *Complete Unit* Accessory Sets
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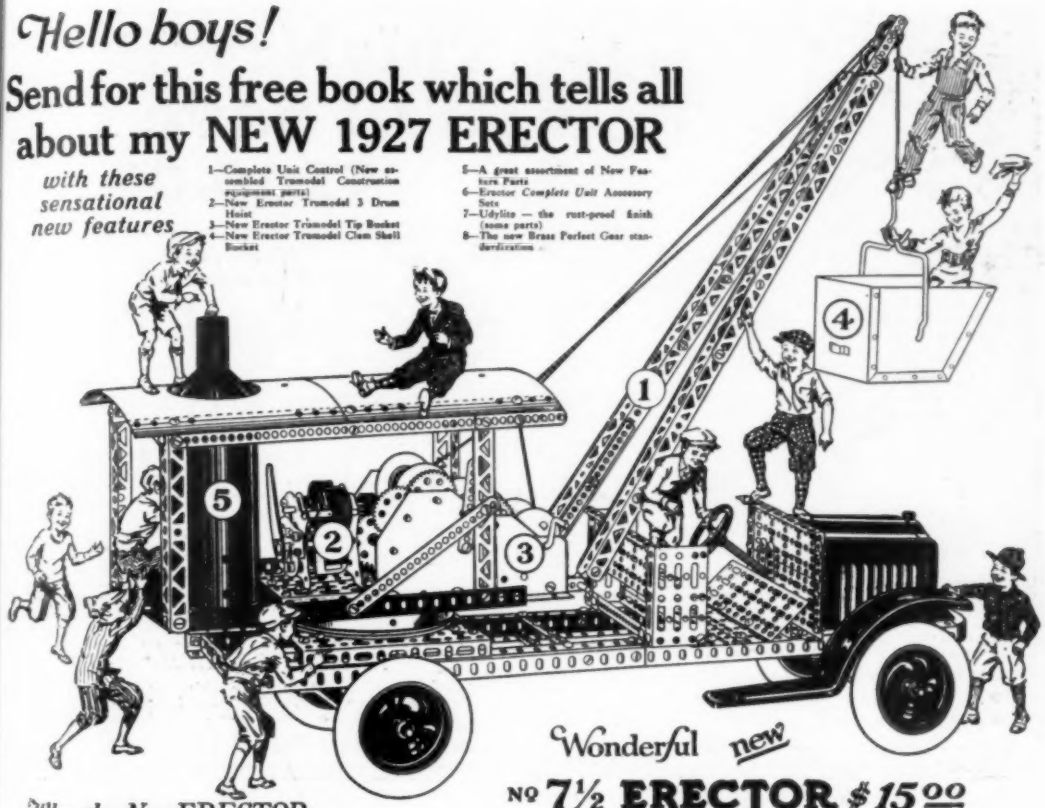

Why the New ERECTOR *is the world's greatest toy*

Trumodel Features:

1 ERECTOR SQUARE GIRDER. This big, exclusive Erector feature makes Erector so sturdy and strong. They are real girders just like engineers use in making skyscrapers and bridges. (In all Erector Sets.)

2 ERECTOR MOTOR. You can make 27 interesting experiments with the Erector Motor alone. The motor Shaft is the same diameter as all other shafts. You can hitch pulleys to both sides of the motor. (In the Famous No. 4 Erector and up.)

3 3-DRUM HOIST. Completely assembled operating unit. New exclusive Erector feature. (In the No. 8 Erector and up.)

4 TIP BUCKET. An exclusive Erector feature. (In the No. 8 and up.)

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Other Erector Features

1 Erector contains more parts and builds more models than any other construction toy.

2 The New Erector Steam Shovel—an exclusive Erector feature. (In Super Erector No. 7 and up.)

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4 Curved Erector Girders. An exclusive Erector feature. (In all sets.)

5 Giant Fly Wheel. An exclusive Erector feature. (In the No. 10 set.)

6 Perforated Strips — four holes to the inch

7 New brass perfect gear standardization. The New Erector contains a great assortment of brass and die-cast gears, including pinion, crown gears, flat gears, mitre gears, and a large 72-tooth gear.

Wonderful *new* No 7½ ERECTOR $15.00

With Automobile Chassis

Here's the set I know will give you the greatest thrill you ever had. Fun! Oh, Boy! It's the real thing, and there's a thrill packed in every one of its 627 parts. Boys, in this great outfit there are hours of real sport waiting for you building automotive models. From this great assortment of distinctive, important and feature Erector parts you can build 554 models—wonderful automobile chassis, tractors, scooters, service cars, fire engines, hook and ladder, are only a few.

Packed in a cabinet and includes a complete assortment of automotive parts, many in colors; also a 92-page manual, powerful electric motor, big red steel disc wheels with oversize balloon tires, fenders, radiator hood, bumper, springs, steering wheel, truck body, heavy truck axles, cab top, boiler, digger scoop—in fact, everything to make this set a world's standard.

Boys! Here's the greatest book I ever compiled

In this book you will find the final story of my years of experience since I first invented Erector—the construction set which other engineers have been kind enough to call "the world's greatest toy"—and which they consider one of the most astonishing mechanical phenomena of the age.

In this book I tell you how with Erector's new Construction parts you can build and operate (one after the other) over 1000 actual working models of Aeroplanes, Submarines, Ocean liners, Light houses, Machine guns, Automobiles, Ship cranes, Trains, Steam shovels, Traveling cranes, Wrecking hoist, Trench diggers, Locomotives, Hoisting derricks, Cantilever bridges, Suspension bridges, Well drillers, Power plants and Hoisting engines.

Think what a thrill you'll get making these wonderful working models whirr and hum with the powerful Erector electric motor. The day you get your Erector (Christmas or any other day) will be the biggest of your life. Send for my new book "Engineering Thrills" today and then tell your Dad. Don't miss this chance. Make him realize what you really want by showing him the book and then taking him to the nearest toy store to see for himself. He'll want to build models with Erector too. Just fill out the coupon below.

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THIS YEAR
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This Christmas—your boy, your girl, or yourself—would prize a PAN-AMERICAN trumpet, clarinet, saxophone or other wind instrument. Order now a PAN-AMERICAN, which leads the world in medium-priced, factory guaranteed band and orchestra instruments. You can learn to play a PAN-AMERICAN in three lessons. Free trial offer from now to Christmas. Easy payment plan. Send coupon today for beautifully illustrated catalog.

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Send me PAN-AMERICAN catalog of medium-priced band and orchestra instruments by return mail. I am interested in
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This new Hi-Q Construction-Manual shows you how simply you can save at least $100, or how easily and quickly you can make large profits through building the advanced CUSTOM-BUILT "Hi-Q Six"—the new receiver that is astonishing experts with its remarkable performance. Prepared by ten of America's leading manufacturers, this 48-page comprehensive manual gives you practical, thorough and complete instructions with charts, diagrams, photos and A. B. C. descriptions. Also includes full instructions for building the Hi-Q Power Supply Unit. Used with equal success by professionals and novices alike. If you want to save at least $100 on your own set or if you want to make big profits building the nationally-advertised Hi-Q Six CUSTOM-BUILT receiver, send 25c immediately before first edition is exhausted.

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ELTO OUTBOARD MOTOR CO., MILWAUKEE

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Genuine Full Cut Diamonds—No Chips

Terms: 6 Months to Pay

No. 6132 $25

This Reg. Trade Mark guarantees you genuine diamonds

No. 6132. Solid Gold Men's Initial or Emblem Ring. 2 Genuine Diamonds 4-100 each. 14-Kt. White Gold Top. Emblem (any lodge) or any initial (Old English) Yellow or White Gold inlaid in Genuine **Hope Ruby or Black Onyx.** Mention if desired in solid White Gold or Green Gold, same price.

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No. 6746 Exact size of ring. $24

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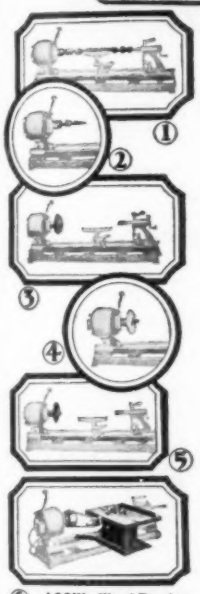
BIG-NEW SpeedWay Shop



LOOK! Wood Turning
The SpeedWay Lathe shown with work in place. Note firm grip and sturdy appearance of this assembly.

Drilling
Shows drill chuck with ¼-inch bit. Tool stock may be run up on rails to provide pressure feed, drill press.

Grinding
Use your SpeedWay Shop for all kinds of grinding. Photograph shows 6-inch grinding wheel fitted on to accessory arbor. Direct drive, no vibration.

Polishing and Buffing
The illustration above shows buffing wheel as used on the accessory arbor. May be used for all kinds of polishing and finishing.

Scratch Brush—Bench Saw
Double metal scratch brush. Removes rust from metals. Photograph above shows No. 266 Bench Saw Driven at 4000 R.P.M. Note simple supporting arrangement. No nuts to tighten. Lifts on and off.

24 FREE BLUE PRINTS
24 working blueprints of toys, furniture, etc., are furnished free with each SpeedWay Shop.

Completely Motorizes Your Work Bench

A big, efficient, practical workshop for regular commercial or home use; operates from any lamp socket. The kind used by carpenters, small manufacturers, machine shops, home craftsmen—yet costs no more. Contains—

Seven Heavy Motor Driven Tools

1—Motor Driven Lathe on heavy cast iron base; takes up to 10 in. diameter and 18 in. length.

2—SpeedWay Bench Drill, ¼ in. in steel or ½ in. in wood.

3—Bench Saw with 6 in. blade; rips, cross-cuts, mitres, grooves.

4—Patternmakers' Jig Saw with 10 in. throat.

5—Motor Driven Grinder, 5 in. emery wheel.

6—6 in. Metal Scratch Brush.

7—6 in. Buffer and Polishing Wheel.

All necessary parts supplied, including two chisels, jig-saw blades, etc.

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To work with the Super SpeedWay Shop is fascinating! Intriguing! Profitable, too. You can make almost anything—attractive, old furniture, toys, home and garden improvements, radio manufacturing, consoles, bric-a-brac, book shelves—countless useful articles which will bring you an easy, neat profit.

$10.00 Down! Pay While You Use It

Our terms are very liberal—we want every man who can use a SpeedWay to order it for 10 Days' Free Trial in his own shop. If you like it you pay the balance a little at a time.

Act Quickly!

Don't hesitate! We want you to know more about the SpeedWay Shop. Write today to this big factory and benefit by our 20 years' experience in making electrically driven tools. We have Sales and Service Stations in most of the leading cities. Your copy of our new, big catalog, showing the complete SpeedWay line of combination shops for the home is waiting for you. Send in the coupon at once.

ELECTRO MAGNETIC TOOL CO.
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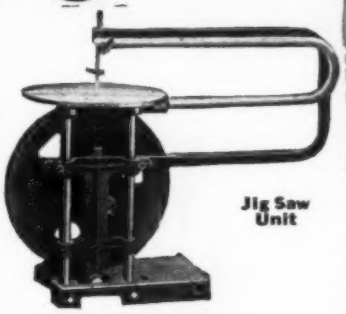
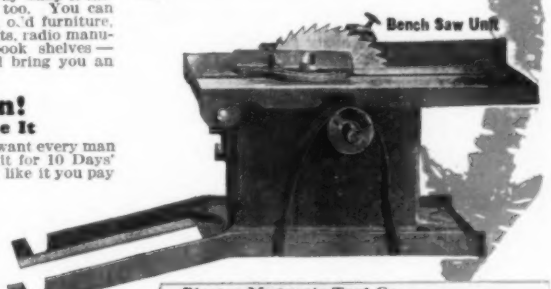
Remember, this is the only company in the world making a complete line of Portable Electric Saws, Hammers, Drills and Grinders.



A Combination to Suit You

For the man who wants a Shop for special uses there are various combinations. Even the $42.50 Shop is built to the same high standards as the one shown above. Send for catalog describing them all.



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Established 1895

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JN4D-2 Curtiss "Jennie" Training Biplane (Shown on bottom above). Complete Construction Outfit, 3 ft. size	7.00
DeHAVILLAND Air Mail Biplane, 3 ft. size. Complete Construction Outfit, 3 ft. size	7.50
NC-4 Naval Cross-Atlantic Seaplane, 4½ ft. size. Complete Construction Outfit, 3 ft. size	10.00
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Ask your Dealer for IDEAL Model Airplanes, or Order Direct if Unobtainable in Your Locality. West of Denver, Colo., and Outside the United States, add 50c to above prices.

Plans for Model Airplanes

For those desiring to build with materials on hand, or ordered as needed, we supply complete Plans with Building - Flying Instructions for any of the Models listed above. Price, including copy of Catalog: **25c EACH**

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The most complete and instructive book on Model Airplanes obtainable. 48 pages of information, prices, etc., on Models, Parts, Fittings, Materials and Supplies. Every Model builder should have a copy. **5c POSTPAID.**

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Established in 1911—16 years ago.

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All Electric Radio

7 Tubes-*Single Control*

JUST plug this Randolph Radio into the electric light socket —and tune in. A powerful, selective radio that gives dependable coast to coast reception. **No batteries, chargers, eliminators, acids or liquids.** Easy tuning with one control brings on all stations. Illuminated drum allows you to operate the radio in the dark and has space for logging stations. Every detail of the Randolph is modern and perfected, unsurpassed regardless of price. It is this wonderful radio that you test and try for 30 days FREE before you buy. When it convinces you by actual performance it is the ideal radio—**you can buy it direct at factory prices.** Be sure you write for free descriptive literature today.

30 DAYS FREE TRIAL

6 Tube $55 Retail Price

Biggest Discounts To Agents

Beautiful Ampliphonic Console

Made of the finest carefully selected heavy solid burl finish walnut. Has built-in genuine large cone speaker that compares with any on the market. Assures unlimited reception of high and low notes clear as a bell. Completely electric—**uses no batteries of any kind.** Beaure you send for fully illustrated, full color folder giving complete details.

Genuine Walnut Cabinets

The finest of heavy, genuine, solid burl finish walnut is used in the making of all Randolph cabinets. No picture can do them justice. You must see them to appreciate them.

6-Tube Radio

Do not compare this set with old-style, 2-dial, 6-tube sets selling for about the same price. The Randolph 1928 Senior Six has also been tested and approved by the leading radio engineers. Beautiful solid walnut cabinet. Single control. Illuminated drum with space for logging. Very selective. **Sent for 30 days free trial.**

All Sets Guaranteed

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Work either full or part time and make big money. Sensationally big discounts to agents. No experience required. Randolph All-Electric Sets sell on first demonstration. Tremendous advertising campaign helps you. Men and women both make big money this way. Demonstrating set sent on 30 Days TRIAL. WRITE NOW for proposition.

USE THIS COUPON TODAY!

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Chicago, Illinois

Send me full particulars about the RANDOLPH Six and Seven-Tube Electric and Battery Table and Console Sets with details of your **30 Day FREE Trial Offer.**

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Mark here ☐ if interested in Agent's proposition.

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The Complete Equipment consists of the powerful Red Jacket Drill Motor with direct drive to the Waco Craftsman's wood turning lathe (capacity 9 in. x 34 in.); a bench saw, that has depth and side gauges, scroll and jig saw; and all accessories for both portable and stationary power drilling, buffing, grinding and cleaning. Attaches to any light socket and converts your work bench into a complete private tool and machine shop.
Turning Sawing Winding Spinning
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Carving Successful Master pieces
ONLY $10.00 DOWN

Give Him This — Craftsman's Wonder Home Work Shop

What finer Gift could a family make to Husband, Father or Son?

What a wonderful gift to the man who loves to work, make, build and create. You keep feeding work and ideas to the "Red Jacket" and it completes each job so quickly, so interestingly and so perfectly that the results urge you on to greater accomplishments. Anything and everything is possible to the owner of a

Red Jacket Waco Craftsman's Lathe

It is a complete chest full of electrically driven tools designed by a master for the private use of tool lovers and men who create, repair and appreciate handy tools at home.

The Famous Waco Red Jacket Guarantee
If our tools are not what you want when you see them, send them back.

Look Out for Imitations: There is only one Red Jacket, one Waco, one Wm. L. Aylward, mastercraftsman.

free CRAFTS COURSE

Special Crafts Course and blueprint service is free to Red Jacket Shop owners—all that there is to know about handicraft methods, raw materials, woods, carving, sawing, turning, designing, carpentering, decorating, is taught by special correspondence.

Buy On Your Own Terms Only $10.00 down. Liberal discounts for cash. Easy monthly payment plans. It is no hardship to own a Red Jacket.

free BLUE PRINTS

10 DAYS' FREE TRIAL

Our literature tells you how to start a job of your own. If you are not pleased return the Shop.

Interesting Literature Free Send the coupon. You will be surprised with all it contains. Beautiful, Instructive, Fascinating, Interesting.

This Headstock furnished where no electricity is available

Mail This to Waco

WACO TOOL WORKS, Inc.
542-4 N. Parkside Ave., Chicago, Ill.

Manager, Dept. 112. Please send me particulars about 10-day free trial, free blueprints, and $10 down payment.

Name.....

Address.....

Perfect Radio Parts for Discriminating Set Builders

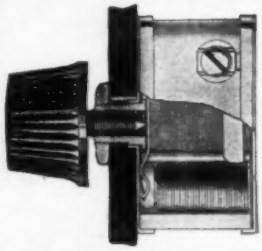
The BRADLEYLEAK

A variable grid leak that provides perfect grid leak adjustment, thereby providing the best possible results with any tube.

The BRADLEYSTAT

The ideal filament control. Gives noiseless, stepless control for all tubes. Can be easily installed in place of wire wound rheostats.

The BRADLEYOHM-E



Standard equipment for accurate plate voltage control on many leading B-eliminators. Provides noiseless, stepless plate voltage control.

The BRADLEYUNIT-A

A fixed resistor that is molded and heat-treated under high pressure. Not affected by temperature, moisture or age. The ideal fixed resistor for B-eliminator hookups.

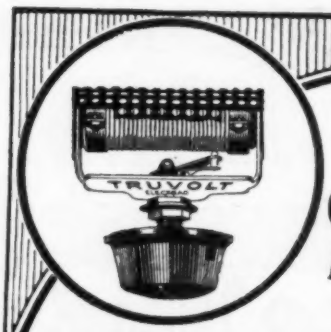
When you build a set or B-eliminator, demand Allen-Bradley Perfect Radio Resistors to secure best results

Allen-Bradley Co.

ELECTRIC CONTROLLING APPARATUS

280 Greenfield Ave. Milwaukee, Wis.

A-B



Constant Accuracy!

TRUVOLT

An All-Wire Variable Voltage Control

Install Truvolt in your B-Eliminator and vary your voltage exactly. A new type wire variable high resistance kept cool by its greater radiation surface —like an air cooled motor.

Develops but ½ the temperature of other resistances of like size; hence is permanently accurate and lasts indefinitely. Positive metallic contact always and 30 exact readings of resistance.

Type	Resistance (Ohms)	Current (Milliamperes)
T-5	0 to 500	224
T-10	0 to 1,000	158
T-20	0 to 2,000	112
T-50	0 to 5,000	71
T-100	0 to 10,000	50
T-200	0 to 20,000	35
T-250	0 to 25,000	32
T-500	0 to 50,000	22.5

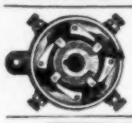
Eight stock types with resistances up to 50,000 ohms. All rated at 25 watts.
Price $3.50 each.

Also a full line of Wire Fixed Resistances.
Write for free **hook-up circular.**

"This Is An Eliminator Year"

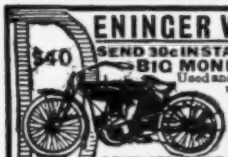
Dept. 17B, 175 Varick Street, New York

ELECTRAD Inc



NEW TIMER FOR FORDS
MARVELOUS INVENTION FREE OFFER TO USERS **FORDYNAMO**
60,000 MILES WITHOUT TROUBLE
WRITE TODAY FOR FREE OFFER
Agents Wanted Everywhere
Eclipse Timer Co., 2933 Meinecke Av., Milwaukee, Wis.

DENINGER WILL TRUST YOU

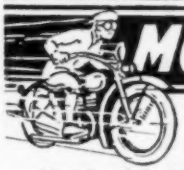


SEND 30c IN STAMPS FOR CATALOGUES
BIG MONEY SAVING FOR YOU
Used and rebuilt motorcycles $25 to $100, used bicycles $9.50, tandems $20. All machines fully guaranteed. New bicycles and motorcycles at factory prices, save dealers' profits. Motorcycle and automobile tires $3. Complete line frames, engines, supplies.
DENINGER PRICE CUTTER, ROCHESTER, N. Y.
PAY AS YOU RIDE

Catch Fish!

Eels, Mink, Muskrats with our new folding galvanized **STEEL WIRE TRAP.** Write for our **FREE TRAP OFFER** and Bargain Catalog. **$1 Box** of our famous Fish Bait FREE to introduce our traps.
WALTON SUPPLY CO., 3501 JUNIATA AVE., ST. LOUIS, MO.

MOTORCYCLES



WE WILL TRUST YOU
Pay As Low As $2.00 per Week
Hendersons, Harley-Davidsons, Indians
Slightly used and rebuilt. Hundreds to select from.
Send 10c for list today.
MYEROW BROS. CO., 15 Berkeley St., Boston, Mass., U. S. A.

Snow-Mantled Hills — Your Harley-Davidson — *and the Great Outdoors!*

MEET old King Winter man to man. Ride a Harley-Davidson Twin out into the clean, crisp air that zips the red blood through your veins!

Harley-Davidson speed and getaway make cars seem logy. Its balance and comfortable springs carry you comfortably and safely. Plenty of room in the side car for a pal and your "plunder". And the running cost is only 2¢ per mile!

1928 models have *both front and rear brakes,* and many other improvements. Prices as low as $310 f. o. b. factory. Ask your dealer about his Pay-As-You-Ride Plan. Mail the coupon for literature.

The Single—our famous solo mount that travels "80 miles to the gallon" and is priced at only $235 complete f. o. b. factory. All models have front and rear brakes and electrical equipment.

HARLEY-DAVIDSON MOTOR COMPANY
Department P Milwaukee, Wisconsin

HARLEY-DAVIDSON MOTOR CO.,
Dept. P, Milwaukee, Wis.
Interested in ☐ Twin, ☐ Single.
☐ Interested in selling motorcycles.
Name.....
Address..... State.....
City.....

HARLEY-DAVIDSON
Motorcycles

Only $1 Down Brings You Either of These Guaranteed Eliminators

ELECTRIFY ANY RADIO

Super-Power "A" Eliminator

This eliminator completely replaces "A" Batteries and the bother and expense of chargers with their disappointments. Here is constant, smooth, unvarying, humless current at 6 volts for any radio using 201-A and power tubes.

Not a Battery-Charger Combination

Large capacity rectifier in this super-power **"A" Eliminator** changes alternating house-lighting current into direct current. Highly efficient heavy duty filter system then changes pulsating direct current from rectifier into smooth, even current for lighting of filament in radio tubes. By simply attaching this **"A" Eliminator** to your set and plugging in the electric light socket your set is instantly supplied with the correct amount of hum-free current. **Requires no attention, as there are no batteries to be charged.** Always reliable whether used once or a thousand times a year. Has no moving parts to wear out. Operates from light socket 110-120 volts, 50-60 cycle A. C., output 6 volts for all sets up to 12 tubes with power tubes.

Test It for 30 Days

Just fill out the coupon below and send it to us with one dollar. We will send you this Super-power **"A" Eliminator.** Try it for 30 days before you pay another cent. If it fails to make good in any way return it at our expense and your money will be cheerfully refunded. Because of our great buying power we are able to offer you this **"A" Eliminator** at ¼ less than it is sold for elsewhere. It is offered complete for only **$31.50** payable in easy installments after you test it.

AT REDUCED PRICES

Super-Power "B" Eliminator

This eliminator **permanently replaces "B" Batteries** and the constant expense of getting new ones. Attached to your radio and plugged into light socket it delivers a steady flow of power. Hum, noise, distortion and all other disturbances are gone. **Used with any good "A" Eliminator it completely electrifies your set.**

Complete with Raytheon Tube

This super-power **"B" Eliminator** can be used with any set up to 12 tubes. It comes complete with full wave rectifying 85 Mil. Raytheon tube, making possible the delivery of great current at a high voltage. This Raytheon tube has indefinite life as it has no filament to burn out. Delivers up to 180 volts.

The case is beautifully finished in olive green Duco with black panel etched in gold. Equipped with rubber-covered cord and socket plug. High voltage taps and variable adjustments enable the use of new power tubes. Operates from 110-120 A.C., 50-60 cycle current. Has tap for intermediate voltage, on which 67½ to 90 volts may be obtained. The detector tap will supply 22½ to 67½ volts. Variable adjuster will deliver any desired detector voltage. On and off switch and high and low voltage switch are integral parts of the eliminator. No additional switches or cords are necessary.

Test It for 30 Days

We make you the same liberal trial offer with this **"B" Eliminator** as with the **"A" Eliminator** described in this advertisement. Ordinarily this **"B" Eliminator** ordinarily sells for the cash price of $42.50. You can buy it on easy installments for only **$28.50** after you have tested it.

NO BATTERY—NO CHARGER
NO BULBS
NO HUM
Nothing to wear out or replace

COMPLETELY REPLACES "B" BATTERIES
Easy to attach
Plug into electric light socket

Mail This Coupon NOW!

ELLIOTT RADIO CORPORATION, Dept. 392
709 West Lake Street, Chicago, Illinois

Attached find $1.00 for which you agree to send me ( ) **"A" Eliminator** at $31.50. ( ) **"B" Eliminator** at $29.50. (Send $2.00 if both are desired as described in ad.) Full particulars will be sent me by return mail and my money refunded if I do not accept your offer.

Name _____

Address _____

City _____ State _____

WITH THAT DEGREE OF ACCURACY ASSURED BY REAL TOOLS

SENT ON TRIAL

ONLY $10 DOWN

HOME MECHANICS MADE EASY WITH THE NEW UP-TO-DATE HOME-CRAFTSMAN SHOP

THIS OUTFIT IS A SUPERIOR DEVELOPMENT OVER ALL OTHERS

Home Craftsmen, Cabinet and Pattern Makers, have found our shop invaluable in making the commodities of their business. Portable, compact and inexpensive, this shop can be afforded by any home or shop mechanic. $10.00 down makes it possible to outfit your bench with this equipment, equal in efficiency and accuracy to any professional machine shop.

The Up-to-date Home-Craftsman Shop, shown above, which can be operated from any home electric light fixture, consists of a Super-½ H. P. Motor, a Genuine Precision Lathe (10 x 34 inches), a six-inch Circular Saw, featuring the Tilting Table Bevel, Miter, Side and Depth Gauges, a Superior Jig Saw for scroll work, all accessories for buffing, grinding, etc., and all portable or stationary drilling and sawing.

Volumes of literature explaining the shop in detail may be had without any obligation by mailing the corner coupon.

15″ Band Saw
Accessory to Up-To-Date Shop

Our Educational and Blue Print Departments

Under personal supervision of Master Craftsman Eugene E. Maurey offers special correspondence crafts course, giving in simple detail full information on home handicrafts. Blue print service giving plans and details for making hundreds of pieces of wood handicraft included in this course FREE to our users.

OUR LITERATURE GIVES ALL DETAILS — Send for it.

YOUR Own Terms On Purchase. **$10.00** down—balance arranged to your convenience. Liberal discount for cash.

4″ Jointer
Accessory to Up-to-Date Shop

GUARANTEE

After receipt of the Up-to-date Home-Craftsman's Shop, if you are not satisfied, without question or delay every cent refunded and return express charges paid.

10 DAY FREE TRIAL

Use our shop for 10 days at our expense. If not satisfied—return—express collect.

MAIL THIS
for full particulars to
Up-to-Date Machine Works
2915 S. Wabash Ave., Chicago, Ill.

MANAGER, Dept. D. Without any obligation, please send me all particulars about your shop, 10-day free trial, free blue prints, free crafts course, also $10.00 down payment offer.

NAME.....

ADDRESS.....

Most Smiles Per Dollar

Your happy face will smile right back at you when you begin to shave with Barbasol. No brush. No rub-in. Noafter-smart. Try Barbasol—3 times—according to directions.

"Mister, you're next!"

Barbasol

For Modern Shaving

The Barbasol Company
Indianapolis, Ind.

I enclose 10c. Please send trial tube.

Name .....

Address .....

P-M-12-27

All Metal Chassis Shielded Ready to Wire

6 TUBE SUPERPHONIC

Radio ALL PARTS MOUNTED

Only $16.95

FREE! 6 TUBES UX 201-A TYPE Tested and Matched

Can be wired in a few minutes

An amazing value that can't be beat! Latest 6 tube tuned radio frequency circuit. Extremely selective, marvelous sensitivity. Two stages of radio frequency, detector and 3 audio amplifiers for improved tone quality. Two dial control. All metal chassis. Shielded. Clear and realistic reception guaranteed. Beautiful front panel, crystalline finish. Metal panel and sub panel; all parts mounted. Simply connect a few wires. No special tools needed. Vernier dials for fine tuning. New type UX sockets. All hook-up wire and colored battery cable included. Value **$60.00**—our price **$16.95.**

COAST to COAST RECEPTION

NO RADIO KNOWLEDGE NEEDED!

Simple Wiring Directions

Very easy to wire this set with the instructions we furnish. Just connect a few wires. That is all. **Can be wired in a few minutes by anyone. No radio knowledge needed.** Make money by wiring these sets in your spare time and selling them to your friends.

SEND NO MONEY

Just write your name and address on a post card and ask us to send you this great outfit together with 6 tubes. We will ship them right away. When they arrive, pay only $16.95 plus a small delivery charge.

RADIO EQUIPMENT CO.
Dept. PH 549 S. Wells St. Chicago, Ill.

For Every Woodworking Job—H & A Equipment

All machines portable, electric—sturdy, efficient, reasonably priced. Just check the machines in which you are interested, write your name and address in the margin and return this ad to us for complete information. Dealers in all principal cities.

HESTON & ANDERSON 612 Depot Street Fairfield, Ia.

INCREASE YOUR PROFITS

Sell more Accessories, Gas, Oil, Tires, Batteries, Repair Jobs, Paint Jobs. You'll sell more of everything if you give a BETTER, MORE DEPENDABLE AIR SERVICE THAN THE OTHER FELLOW. Only $12 Monthly pays for the dependable HB Ball Bearing, Silent Spiral Bevel Drive, Automatic Air Compressor. Try it in your shop for 30 Days At Our Risk—on absolute Money Back Guarantee.

A letter or card will bring complete details.

HOBART BROTHERS, Box M1272, Troy, Ohio

AGENTS!

Improved Dubeledge Stropper Pays You $100.00 Weekly

Think of it! Over 500 clean satisfactory shaves from a single razor blade. Tell men how to shave for over a year, with one blade, by stropping with new Dubeledge razor blade stropper. Make an easy $100.00 a week. Sharpens all edges in one operation. Makes new blades out of old ones in a jiffy.

Sensational Features *get Quick Sales*

Nearly every stropper on the market sells for $3.50 to $5.00. Here's one with features the others do not have, yet it sells for $2.00. Sharpens with true diagonal stroke all edges without removing blade. Easy to work—nothing to get out of order—guaranteed to last lifetime. Show these Dubeledge features and the sale is made.

STROP WITH A TRUE DIAGONAL STROKE

Read This Big FREE Offer

We give free with every Dubeledge stropper our new patented pencil. Automatically feeds new leads, one after other by pressing top. Writes 48,000 words, or one year without refilling. Quick sales assured with this free offer.

Write for *Free Plan*

Get facts free. We show you how to make at least $100.00 a week. Postcard will bring information.

MORTON SALES CO.,
Dept. 812 10-15 46th Ave., Long Island City, New York

PLUMBING-HEATING

Install Your Own—Save Half

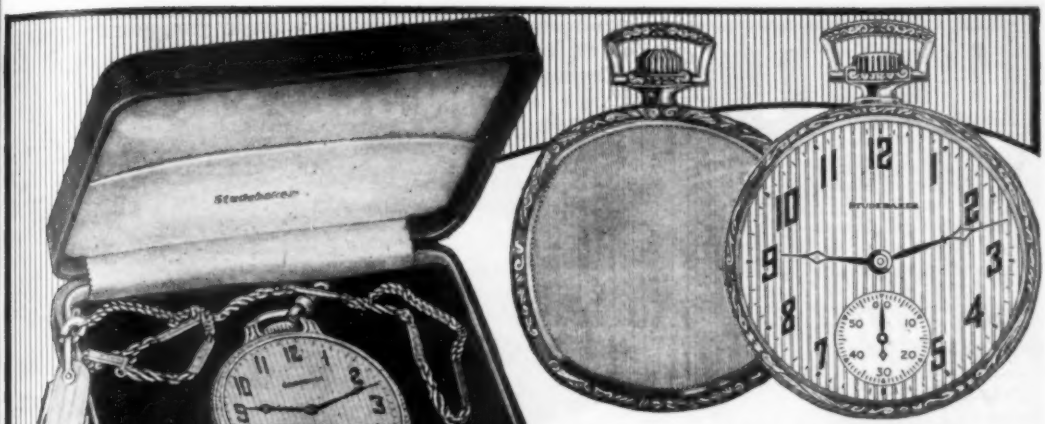
Lowest wholesale prices on highest quality Grade A goods. Any Handy Man can install his own Plumbing and Heating BY OUR NEW EASY METHOD. Get the best and pay only a little each month.

Send for FREE Book

New bargain catalog just issued. With our cut-to-fit systems you save waste material and high labor cost. 50 years of economical service to home owners, farmers, builders and mechanics. Million Dollar Plants back up our Bonded Guarantee. FREE book gives you the whole story.

Write for your copy today.

OVER 50 YRS. **HARDIN-LAVIN Co.** EST. 1876
107-17 West Pershing Road, Chicago, Ill.



Sent for only $1.00 down

DIRECT FROM FACTORY

Here is the greatest buying opportunity today! Just $1.00 down brings you the famous 21-Jewel Studebaker Watch direct from factory. Balance in easy monthly payments. Lowest prices ever named for equal quality. You save fully 30% to 50%. Your choice of 80 magnificent, new Art Beauty cases and dials. Latest case designs in yellow, green and white gold effects. Exquisite thin models. 12 Size and 16 Size. Send coupon for catalog of Advance Watch Styles and full particulars.

21 JEWEL ~ *Extra Thin*

STUDEBAKER

The Insured Watch

The Studebaker Watch Company is directed by members of the famous Studebaker family—known throughout the world for three-quarters of a century of honest dealing. Studebaker Watches have 21 Ruby and Sapphire Jewels, 8 Adjustments—for heat, cold, isochronism and 5 positions. Made so good we insure them for your life-time. Insurance policy free with every Studebaker Watch. Ladies' Bracelet Watches, Men's Strap Watches, Diamonds and Jewelry also sold at lowest prices and easy monthly payments. Send coupon for details.

MAIL COUPON for FREE BOOK!

Let us send you a copy of our beautiful new 6-color catalog. It contains complete information on watch making. It tells how you can buy a 21-Jewel Studebaker Insured Watch direct from the maker—save big money—and pay for it in easy monthly payments. Mail the coupon.

SPECIAL OFFER! Watch Chain FREE!

For a limited time we are offering a magnificent Watch Chain Free. To all who write immediately we will include particulars of this astounding offer. Time is limited. Send the coupon NOW before this offer expires!

STUDEBAKER WATCH COMPANY

Directed by the Studebaker family-three-quarters of a century of fair dealing

Watches • Diamonds • Jewelry

Dept. N-806 • South Bend, Indiana

Canadian Address: Windsor, Ontario

Mail This Coupon

Our Diamond and Jewelry Catalog is just off the press. Your copy will be sent you FREE if you mail coupon.

STUDEBAKER WATCH COMPANY
Dept. N-806, South Bend, Indiana

☐ Please send me your free catalog of Advance Watch Styles and details of your $1.00 down offer.

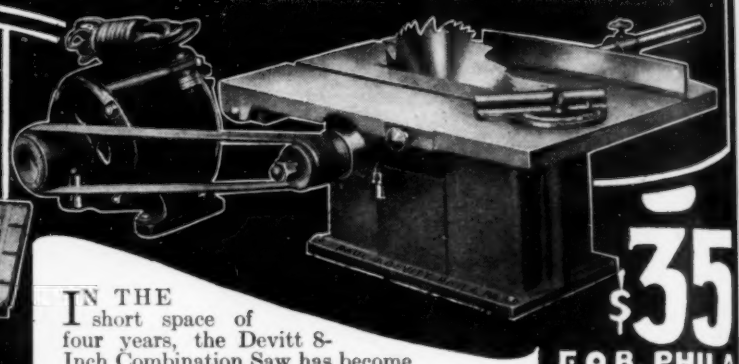
☐ Please send me free catalog of Jewelry and Diamonds.

Name .....

Street or R. F. D. .....

City ..... *State* .....

DEVITT 8" COMBINATION SAW
8,000 IN USE!



$35 F.O.B. PHILA

A SHOPFUL OF TOOLS WITHIN ARMS REACH!

SAW TABLE RAISED SHOWING EMERY WHEEL, SAW GUARD AND DRILL ATTACHMENT

PLANER ATTACHMENT ON SAW TABLE

SHOWING SANDING DISC ATTACHED

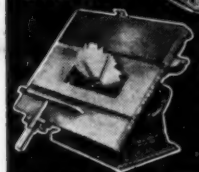
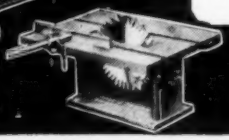


TABLE TILTED FOR BEVELING



DADO HEAD ATTACHED FOR GROOVING

IN THE short space of four years, the Devitt 8-Inch Combination Saw has become a practical necessity in thousands of shops, factories and households everywhere. Many imitators have sprung up, but Devitt leads them all. Think of the convenience and economy of this handy little machine that will rip, cross cut, bevel, miter, groove, mortise, tenon, drill, rabbet, grind, buff and polish. Attachments are easily and quicky adjusted. The saw and motor, when set up for work, occupy very little room. Saw is equipped with ¼ H.P. 60 cycle, 110-volt A. C. Motor which can be attached to ordinary light socket, and provide power for other purposes when wanted. A cut up to 2¼" can be made without planing. Comes complete with following attachments—12"x16" table, 8" Combination Saw, iron pulley for saw table, 10" ripping fence, adjustable cut off miter gauge, motor-specifications as above, 1¼" endless leather belt, wood pulley, 8 ft. cord and plug, 6" buffing wheel, ⅜" 3 jaw drill chuck, 5" emery wheel, 6" sander, saw guard, and 2" dado insert. $35.00 F. O. B. Phila. Height 7½", shipping weight, 100 lbs.

(Only $12 extra for Planer Attachment to fit on table top. Can smooth pieces up to 2 inches wide. Price, F. O. B. Phila.)

Send today for our attractively illustrated 4-page circular

PAUL J. DEVITT
Dept. B 1102 SOUTH 2ND ST. PHILA., PA.

Ask for Keds by name

They are not *Keds unless the* name *Keds is on the shoe*

STOP Ford & Chevrolet CRANKSHAFT **END-PLAY!**

C-A ADJUSTABLE BEARING corrects and prevents end-play without removing motor. Eliminates many troubles. Easy to install—simply drop pan. For Fords, $2.75; for Chevrolets, $4.25. Ask your dealer or sent prepaid by ADJUSTABLE BEARING CO., Dept. P, 405 Virginia Ave., Indianapolis, Ind.

Better Than A Brush

The Lacquer-Well Spray Gun

for all brushing lacquers including brushing Duco.

Dozens of Uses

Lacquer your auto. screens, etc. Make your old furniture like new. Change tanks and use it for oiling springs or touch up work, etc. Splendid as plant or disinfectant spray.

Sturdy, lasting service, quality made — Sent postpaid anywhere in U. S. upon receipt of only $2.00, extra tanks 25c each.

THE LACQUER-WELL SPRAY COMPANY
Dept. 2 2012 East 105th St. Cleveland, Ohio

MAKE YOUR FORD Into The "LARK"

$5.00 Red-i-Kut life size patterns

Famous sure-fit *RED-I-KUT* life-size patterns and picture instructions show how you can easily convert your Ford into this **Fast, Saucy, Sport** Car as thousands have done with easily obtained materials. No need to lay up the car. Rear seat folds, making 4-passenger car. *Send 10c coin for actual body photo and new manual of other distinctive sport body patterns from $3.50 up—"RKO" Sled "Swing-Lo" irons, Tops and Windshields. ORDER RIGHT NOW.*

KUEMPEL COMPANY, 91 Kuempel Bldg., GUTTENBERG, IOWA

MOTORCYCLES

Price $10 and up purchased through our Co-Operative Plan for as low as $1.00 down and $1.00 per week

Indians Harley-Davidsons Ace Henderson and Clevelands

Send ten cents for Bulletin A.

Motorcycles shipped to all parts of the world

WALKER-INDIAN CO., 78 Brookline Ave., BOSTON

The World's Most Amazing Gun

The Benjamin

Safe and Accurate

America's Original Genuine Compressed

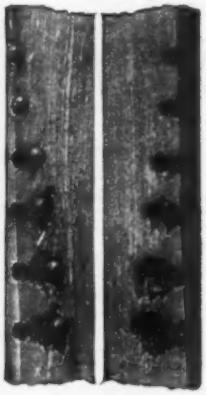
Air Rifle

It's the straightest shooting, hardest hitting most accurate compressed air rifle you ever saw. Unlike all others. Shoots regular inexpensive air-rifle shot. Ideal for target practice or small game. Absolutely safe.

$5.00 Postpaid or at your dealer's

Any Shooting Force Desired

One stroke of the pump gives light penetration. Two strokes a little more. Six strokes of the pump will drive the shot clean through a half inch plank. Note the tremendous controlled shooting force as illustrated below. Picture shows shot imbedded in 1-inch block.



Showing power of penetration using from one to six strokes of the pump.

Read These Letters

"I am enclosing a photograph of me and my squirrel. I certainly recommend the Benjamin very highly. A few days ago I saw a squirrel in the top of a high tree. I fired and brought him down with a bullet in the back of the shoulder. For any boy that likes hunting like me, he ought to get a Benjamin. Norman Gile, Braintree, Mass."

"Please send me two new valves for my Model E Benjamin. The gun has been in use for 12 years and this is the first repairs I have had on it. M. C. Dunsford Sullivan, Missouri."

"I take this opportunity to congratulate you on your Benjamin Air Rifles for they are the only make which gives such marvelous results. Albert Stins, Port au Prince, Haiti, W. I."

No Springs to Break or Weaken

No cleaning required. The Benjamin is always ready to shoot. Accidental discharge impossible. Nothing to get out of order. No complicated mechanism to jam or springs to weaken and break. Retains its shooting force for years.

For Young or Old

The Benjamin is not a toy. Yet it is safe for boys to handle. It is the one and only gun for boys who have passed the pop-gun stage but who are not ready to own the more dangerous powder shooting gun. Take-down walnut stock. Nickel plated barrel. *Guaranteed for one year* from date of purchase.

The Ideal Xmas Gift for Any Boy

It is as natural for a boy to want a gun as it is for a girl to want a doll. Here is a gun for a Xmas gift that is absolutely safe, yet will delight any boy who loves to hunt and wants a real gun. If your dealer cannot supply you, order direct from factory. Satisfaction guaranteed. Use coupon.

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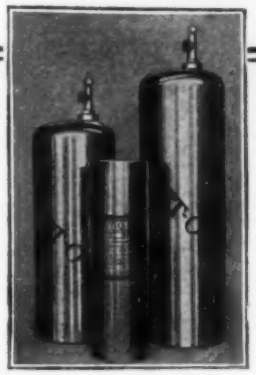

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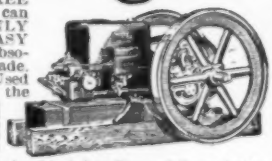

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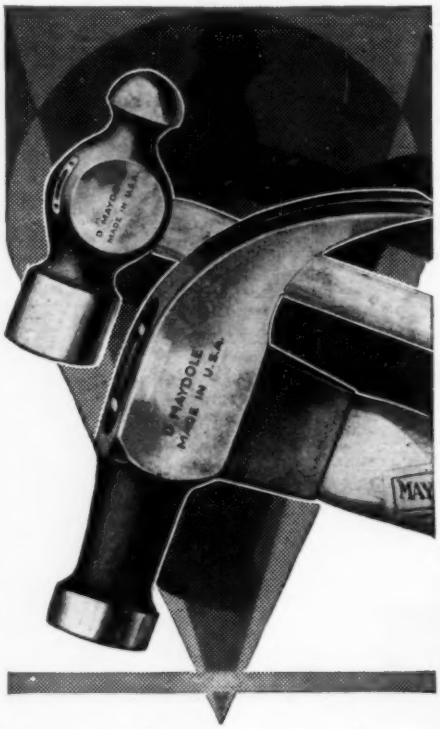

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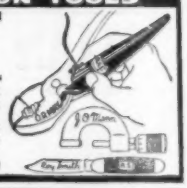

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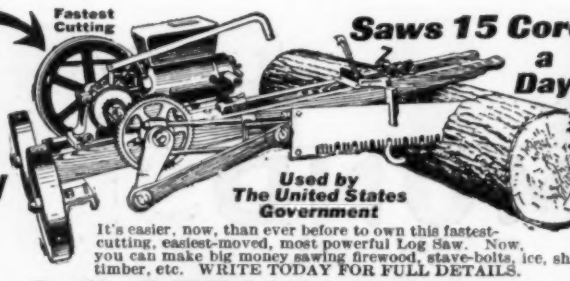

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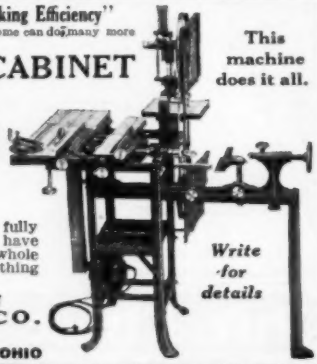

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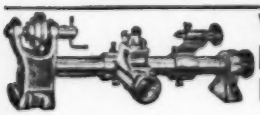

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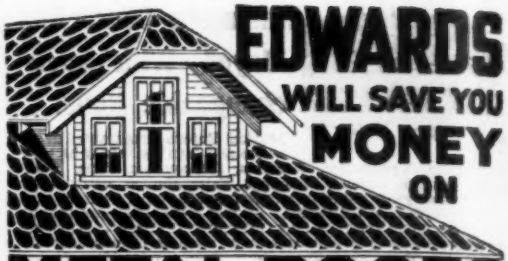

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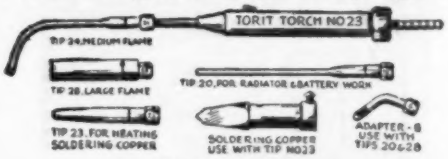

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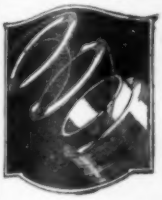

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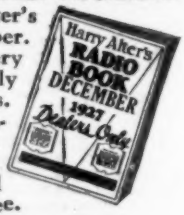

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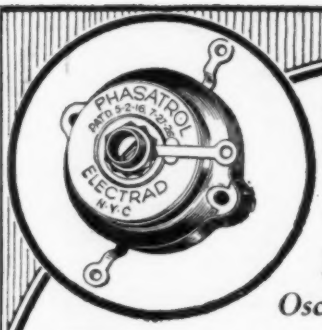

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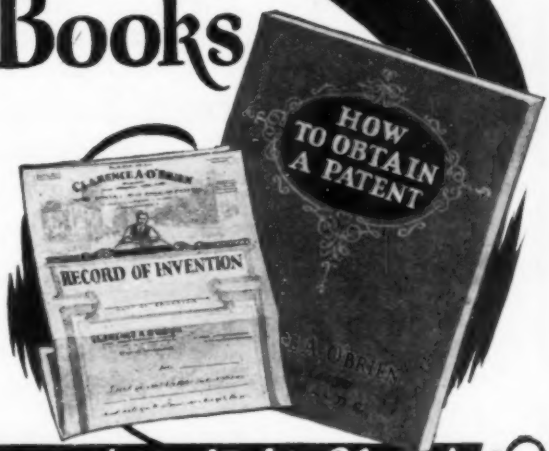

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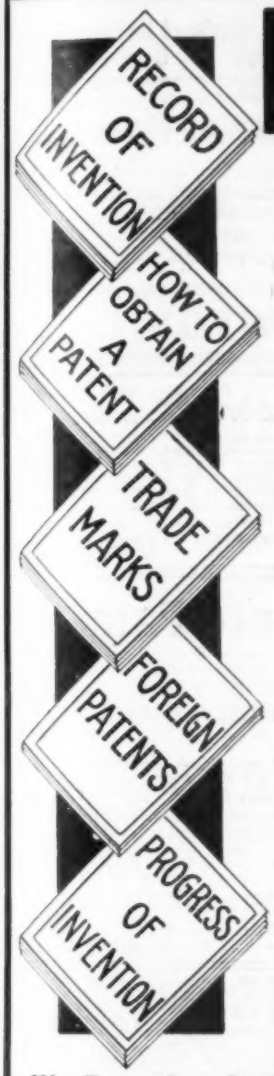

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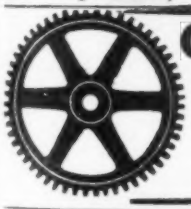

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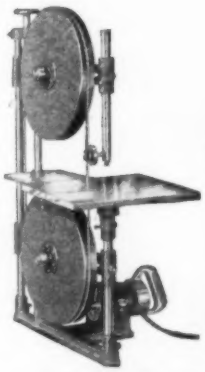

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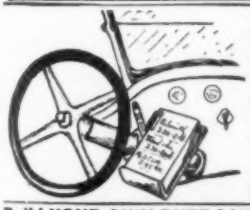

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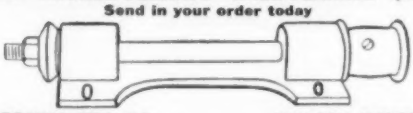

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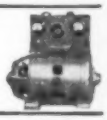

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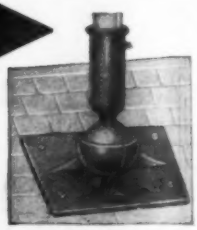

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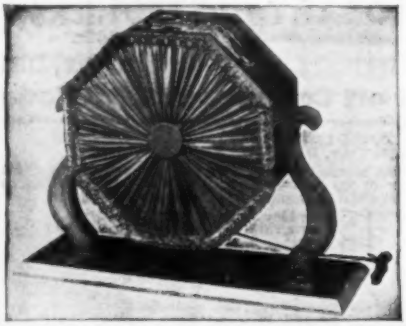

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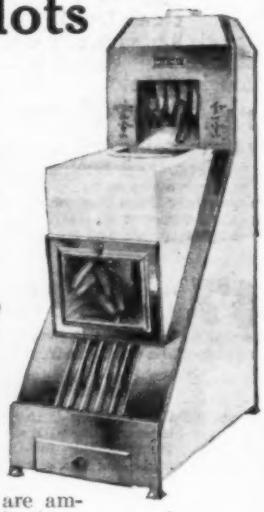

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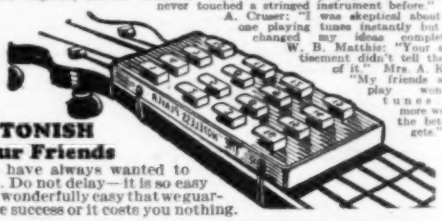

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Mail Coupon Today!

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Send free book telling how I can get more fun out of life, make more friends, have greater opportunities for getting ahead by learning to play my favorite stringed instrument in 10 minutes. No obligation.

Name.....

Address.....

City.....State.....

$351.00 CLEARED ~ IN ONE DAY

So writes W. H. Adams of Ohio. Letter from V. A. Marini of California reports **$11275** sales in three months. Jacob Gordon of New Jersey "**$4000** profits in 2 months." Alexander of Penna. "**$3000** profits in four months." Ira Shook **$365** sales in one day. Bram bought one outfit April 5 and 7 more by August 28. Iwata, bought one outfit and 10 more within a year. Mrs. Lane of Pennsylvania says "sold **8000** packages in one day." J. R. Bert says "only thing I ever bought that equaled advertisement." John Culp says: **"Everything going lovely.** Crispette wrappers scattered all over town. It's good old world after all." Kellog, **$700** ahead end of second week.

WE START YOU IN BUSINESS

Furnish secret formulas, raw material and equipment. Little capital required; no experience needed.

Build A Business of Your Own

No limit to the sale of Crispettes. Everybody likes them. It's a delicious food confection. Write for facts about a business that will make you independent. Start now, in your own town.

Profits $1000 a Month Easily Possible

Send postal for illustrated book of facts. It contains enthusiastic letters from others—shows their places of business, tells how and when to start, and all information needed. Free. Write now!

LONG-EAKINS COMPANY

1228 High Street **Springfield, Ohio**

Save Your Feet

When all else fails, end your suffering with the

Heefner Arch Support

No Metal

Fully patented. It re-adjusts the entire foot. Write for free book and statements from doctors and users.

Heefner Arch Support Co. 658 M. E. Taylor Bldg. Louisville, Ky.

AUTO RUNS 40 MILES ON GALLON OF GAS

Automobile engineers who worked for years in an effort to reduce gasoline consumption have found the solution in a marvelous invention that fits all cars. An actual test made by one of the engineers showed 40 miles on a gallon of gas. Thousands of car owners have already installed this new invention. They not only report amazing gas savings but are also surprised to find quicker pick-up, instant starting, smoother running motors and disappearance of carbon. E. Oliver, 999-151 E. Third St., Milwaukee, Wisc., for a limited time is offering a free device to those who will help introduce it. He also needs men everywhere to make over $100 weekly in their own territory taking care of local business. Write him at once for free sample offer and big money making offer.—Adv.

NEVER Too OLD to Learn

IS *music* one of the big things in life you've *missed?* Don't give up. It's never too late to start with a

BUESCHER

True Tone Saxophone

This is the one instrument you know you can learn to play. If you can whistle a tune you can't fail with a Buescher. You can learn to play quickly, with comparatively little effort.

Join the Home Town Band

With the aid of the 3 lessons given on request with each new Buescher, many learn scales first hour and play tunes first week. You can teach yourself, and in 90 days join the Band, or play with an orchestra, at good pay.

Only Buescher Assures Success

But only with a Buescher is this rapid progress assured. You don't have to fuss and favor for certain notes. Just open the key and blow normally. Every tone full, clear and true.

Six Days' Trial. Easy Terms

Take any Buescher Instrument home for 6 days' trial. If you like it, pay a little each month. Send coupon for beautiful catalog and details of this liberal plan. There will never be a better time to start. Write today.

BUESCHER BAND INSTRUMENT CO.

Everything in Band and Orchestra Instruments

2183 Buescher Block Elkhart, Indiana

BUESCHER BAND INSTRUMENT CO. 395A
2183 Buescher Block, Elkhart, Ind.

Gentlemen:--Without obligating me in any way please send me your free literature. Mention instrument interested in.

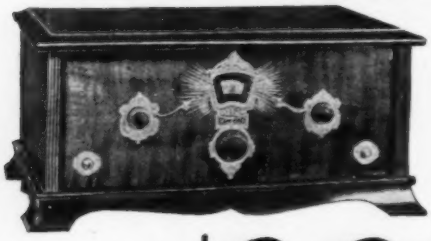
Age?..... Name instrument.....

Name.....

Address.....

30 DAYS FREE TRIAL!

SEND NO MONEY FOR *the* CON-RAD SINGLE DIAL CONTROL 6



6 TUBES 1 DIAL COMPLETELY ASSEMBLED RETAIL PRICE $66.66

Save 1/3 to 1/2!

You can now buy at wholesale the famous Con-Rad sets—manufactured under license grants from Radio Corp. of America; Westinghouse Electric Mfg. Co.; General Electric Co.; and American Telephone and Telegraph Co. The Con-Rad Super Six—with single control and illuminated dial—is the ultimate in radio receivers. A 30 Day Free Trial will convince you of Con-Rad superiority. Latest 1928 Model—Walnut Cabinet—shielded chassis—can be operated by a child—and guaranteed to give complete satisfaction.

A CON-RAD in Your Home Means Money for You

Men and women making big profits selling Con-Rad Receivers through home demonstrations. Full or spare time. Low factory wholesale prices enable you to cash in on the radio sensation of the year. Write today for complete information.

Another CON-RAD Success!

Six tube model—single dial control—completely assembled in latest model table cabinet. Retail Price, $34.75. Tremendous buying power enables us to sell this set at this low price. Con-Rad Radio Sets are sold exclusively by Consumers Radio Co.

Our generous Free Trial offer makes it easy for you to hear a Con-Rad in your own home.

CONSUMERS RADIO CO.
4725 Lincoln Avenue Chicago, Illinois

Consumers Radio Co.,
4725 Lincoln Ave.,
Chicago, Ill.

Dear Sirs:
Without obligation on my part, send me full details of the Con-Rad 30 Day Free Trial Offer.

Name.....

Address.....

City.....

State.....

☐ Also send me Home Agents Proposition.

Majestic

Most Popular "B" Power Unit for radio sets in the world

IMPROVED RADIO RECEPTION

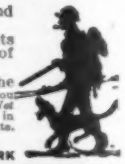
Plugs into Light Socket. No Hum or Blast. Only fraction of cent cost per hour. Any good radio dealer will sell on approval.

The Super "B" illustrated below is only $29.50, complete with Majestic Super-Power B-Rectifier Tube. Write for booklet on "Better Radio Reception."

Grigsby-Grunow-Hinds Co.
4541 Armitage Ave., Chicago

No Acids-No Liquids

RABBIT HUNTERS See and Try The "SCREW-BUG"



A mechanical ferret, for hunting Rabbits, Ground Hogs, etc.

"It travels round the curves and bends, and gets 'em out of their holes and dens." Thousands of satisfied users in the past three years.

One trial will convince you of its merits. The "SCREW-BUG" is sold and shipped by the inventor, direct to you by U. S. Mail, allowing a five day trial, with an absolute, *If Not Satisfied* Money back guarantee. Price $4.00 each with order in U. S. A. Prepaid, or C. O. D. plus postage. We have no Agents. Write for Free circulars.

THE GRABOW CO., Dept. A, Franklin Square, L. I., NEW YORK

Model Ship Builders "FLYING CLOUD"

Our special "Flying Cloud" construction set contains all necessary materials according to specifications. The model maker will be assured of an accurate model by purchasing one of these reasonably priced sets. Our new catalog containing reproductions of photos of various ship models, together with prices of all sorts of fittings, materials, tools, etc., sent postpaid upon receipt of 10c.

MODEL SHIP SUPPLY CO., Dept. M, Mineola, N.Y.

HELLO JAPAN!

The thrill of receiving Tokio, Japan and Sidney and Melbourne, Australia on a Magnaformer 9-8 was experienced by K. G. Ormiston and party on the night of September 11, 1927—**6,000 to 9,000 miles** on the loud speaker with a world of volume. The thrill of great distance added to the sonorous, true-to-life tone quality for which the **Magnaformer 9-8** is famous, gives you a truly supreme entertainment combination. The Magnaformer 9-8, Creator of True Tone Quality, "Commander in Chief of the Air," is the finest and most powerful receiving set ever designed.

The secret lies in the perfect **Magnaformer Intermediate Long Wave R. F. Transformers** with which it is equipped. Prominent Radio Editors are giving these coils highest praise in editorial articles in Radio, Popular Radio, Radio Doings, Citizens' Call Book, Radio World and other magazines and numerous newspapers. Each coil is unalterably peaked at 69.73 Kilocycles (4300 meters). They are so securely and scientifically put together mechanically that nothing can change their electrical characteristics. **It is the greatest set in the world.** Build it from the fully illustrated official construction sheet 28x34 inches, both sides printed solid.

Send at once, right now while you have it in mind, for FREE Illustrated Magnaformer story, wonderful testimonials and full account of K. G. Ormiston's unique experience—W. D. Scott's challenge and defeat. *Don't build a set 'til you hear from us in a day or two.*

RADIART LABORATORIES COMPANY
19 S. La Salle Street Dept. 79 Chicago, Ill.

Home Electric Hair Clippers

Made by old, experienced manufacturers of barber clippers. Plugs into your light socket and anyone can use it successfully for trimming, bobbing, shortening bangs, clipping neck, in fact saves barbering bills for the whole family. Equally practical for removing superfluous hair under arms, on forearms or legs. Cuts clean as a razor. Does not clog, pull, nor cut the skin.

Saves Its Cost

The Home Electric Hair Clipper is a tried and proven appliance — now used in thousands of homes. Does work equal to the best barber clippers. Rigidly guaranteed. Takes the place of razors and dipilatories for women.

A Valuable Christmas Gift

Put a Home Electric Clipper on your Christmas shopping list for mother, father, brother, sister or a friend—a useful gift that will be highly appreciated.

Ten Days' FREE TRIAL

The Home Electric must sell itself to you. If your hardware or electrical dealer can't supply you, send today for interesting booklet or order from this ad. Pay postman **$8.75.** Use it for 10 days, then if it doesn't prove a wonder, a money saver, return it in good order and your money will be refunded. State whether your current is 110, 220 or 32 volt.

ALLOVER MFG. CO.
Dept. 30. Racine, Wis.

Dealers and Sales Representatives Wanted

A new practical and profitable line. Sells summer and winter to men and women. *Write for plan.*

ACME K-1A $25

ACME K-3 Single Free Edge Cone $14.50

The Speaker that *Deserves* Such Broadcasting

EVERYBODY KNOWS present-day broadcasting deserves a good speaker. But here's the speaker that DESERVES such broadcasting!

[It took five years and 320 experimental models to produce the new Acme double free edge cone speaker!]

Full orchestra volume without distortion. Takes full output of all power tubes without blasting and without additional apparatus. Beautifully designed. Richly finished in walnut.

Never until you actually hear and compare the Acme, can you fully appreciate the remarkable improvements that have been made in radio reproduction since your present loud speaker left its factory.

If your dealer does not carry Acme speakers, we will supply you direct. Send coupon for Acme booklets described below.

Look for the ACME head

ACME
–for amplification

ACME APPARATUS CORPORATION
Dept. PM-1, Cambridge, Mass.

Gentlemen:—Please send me a copy of booklet checked below. I enclose 10c for each copy.

☐ Amplification without Distortion—*How to Improve Any Radio Set*

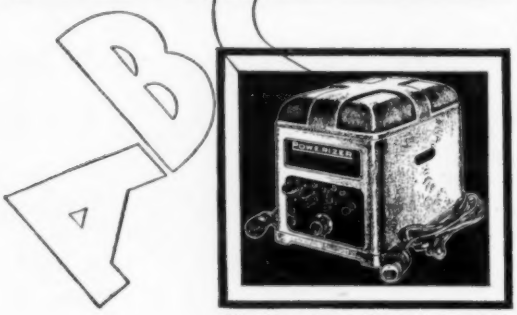
☐ Power Supply for Radio Sets—*The Story of Socket Operation*

Name.....

Street.....

City.....*State*.....

POWERIZER



Model for Atwater Kent and other standard sets $60
Radiola "20" model without tubes .. $59

Now you can make any good set a new $500 type A. C. Electric Receiver

ANY Radio—equipped with a Powerizer—operates with the newest R.C.A. tubes which require no batteries—B eliminators or convertors.

The world's finest tone quality is yours. Powerized sets are real light socket sets perfected by pioneers in powerized amplification . . .

Have your set equipped with a Powerizer—you'll have a permanent source of power and a set that will be modern in 1938 . . .

Hear a Powerized Atwater Kent—a Powerized Radiola 20 or any good set with a Powerizer . . . Compare it with any other A.C. Receiver selling at $500 to $800 . . . The only difference will be in the saving you make.

Write for literature explaining details of real A B C socket-power and tone quality.

RADIO RECEPTOR CO., INC.
106 Seventh Ave., New York

Licensed by Radio Corporation of America and Associated Companies

Improve Your Radio With this R. F. Choke

The New HAMMARLUND R. F. CHOKE

Distinctive in Principle; Superior in Performance

In your radio are two kinds of currents—both necessary. But they must be kept in proper channels if you would have stable reception and good tone quality.

The new Hammarlund R. F. Choke puts a leash on radio-frequency currents and keeps them in their own "backyard." Your receiver is not modern without one or more. Ask any radio engineer. Two sizes—85 and 250 millihenries.

Write for Folder

HAMMARLUND MANUFACTURING CO.
430 W. 33rd St., New York, N. Y.

For Better Radio
Hammarlund
PRECISION
PRODUCTS

COASTER WAGON GIVEN

HEAVY BUILT RUBBER TIRES

SEND NO MONEY We Trust You

BOYS! Here is 16 x 36 inch Wagon 10-in. heavy disc wheels with roller bearings; 1-inch rubber tires. Specially made body of seasoned wood—heavily reinforced with steel braces. *Send for 12 boxes famous* **UCA-MENTHO Healing and Vapor Salve** *which sells at 25c a box.* We also send *12 packs perfume* which you **Give Away FREE** (to help sell the salve), and easy plan for obtaining this Coaster Wagon. Don't send a penny. We are reliable.

UCA MFG. CO.
Dept. 3A78, CHICAGO

EXCEPTIONAL XMAS OFFER $25.50

Retail Price $49.50—Limited Time ONLY

Agents Make Big Profits Before XMAS

X-Ray Electric Vacuum Cleaner Shipped C. O. D. Anywhere on 10 DAYS TRIAL

Powerful Suction with Special General Electric Motor Fully Guaranteed

EVERY Convenient Attachment FREE

The Morrow Co., Inc.
326 W. Madison St. CHICAGO

AGENTS WANTED

STEEL BLUE **Elite Diamond**
IF YOU CAN TELL IT FROM A DIAMOND
SEND IT BACK!

1 Carat Elite Diamonds. Matchless for their dazzling rainbow brilliancy. You'll be delighted. Elite Rings surpass all others. Stand acid and other tests. Handsomely Engraved Ring, sterling **Guaranteed.** Looks like **$250.00.** Proud owner offered **$85.00** 5 minutes after buying one.

COLLAR AND CUFF LINKS GIVEN

With each ring order, we give free beautiful Combination Set. Set with small Elite **Diamonds. SEND NO MONEY.** Just send name, address and finger size. On arrival pay postman $3.89 and postage. Satisfaction Guaranteed. Write today. Cash with Canadian or foreign orders.

ELITE JEWELRY HOUSE, Dept. 376, 609 S. Paulina St. CHICAGO, ILLINOIS

Radio

$5.00

Postpaid to any city in the U.S.A.

No Tubes
No Batteries
No Static
No Upkeep

Guaranteed for one year. Brings to you, at a range of 10 miles, ALL PROGRAMS from local broadcast stations.

Clarity of Tone Unsurpassed

BUY ONE FOR A "SHUT-IN"

Special Light Weight Ear Phones $2.50 Additional

APPROVED BY Popular Radio Laboratory, Radio Broadcast *and thousands of others.*

Described on Page 659 October Issue POPULAR MECHANICS

FLASH RADIO CORPORATION
127 Federal Street Boston, U. S. A.
AGENTS WANTED

IS YOUR LOUD SPEAKER PARALYZED?

If your Speaker is one of the majority which acts "Dumb" with no apparent cause, ask your Dealer for the Muter Clarifier, or write us for full particulars about this miraculous new Radio necessity which assures Full Tone, Clarity and Volume.

Leslie F. Muter Co., 76th and Greenwood, Dept. 805-T, Chicago, Illinois

MEN'S STRAP WATCH
DIRECT FROM SWITZERLAND

$3.99

Radium Dial Jeweled Movement

Silveroid, Cushion Shaped Case

This fully guaranteed watch cannot be manufactured in America for less than $12. Genuine leather strap. Accurate--durable--handsome. **SEND NO MONEY.** Pay on delivery $3.99 plus postage. "FED CO."
U. S. Swiss Agents, 561 Broadway, New York City. Dept. W-10

MAKES RADIO STATIC UNHEARD

A simple, amazing device has been invented by C. H. Geppert, W-207 Hewitt Bldg., Des Moines, Ia., which filters 50 to 90 per cent of static in radio receiving sets. Not only that, but when static is not bad, you can increase your volume tremendously, bring in more distant stations, save 30 to 40 per cent on batteries, eliminate local stations from running in, give your set at least one more stage of radio reception and greater selectivity. Works on all radios; can be attached instantly by anyone without change to set. Mr. Geppert wants agents and is willing to send a no cost sample. Write him today.

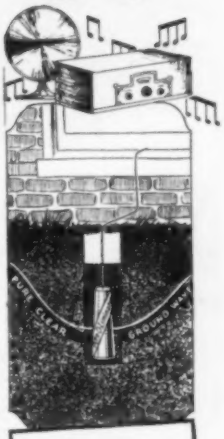
Amazing NEW Ground Antenna

Gets Everything but Static

Brings in Faraway Stations Loud and Clear Regardless of Static Conditions

Fans everywhere are replacing their troublesome and static gathering up-in-the-air aerials with the marvelous new GROUND ANTENNA —Aer-O-Liminator— Radio engineers and hundreds of users testify that Aer-O-Liminator gets better long distance reception, almost unbelievable freedom from outside noises, far greater selectivity and marvelously true, clear sweet tone quality.

John E. Christenson, **radio engineer, Chicago,** writes: "I have tested and thoroughly approve the Aer-O-Liminator. I find it increases selectivity and volume without distortion, practically eliminates static, gives good clear tones, both on local and distant stations. I would recommend the use of the Aer-O-Liminator to every radio owner to get the best reception from his set."



Easy to Install

FREE TRIAL

Makes this thrilling test at our risk!

Install an Aer-O-Liminator (Ground Antenna). Leave your old overhead aerial up. Try out on a night when static is bad. If you do not get a wonderful improvement in freedom from static, greater selectivity and clear sweet tone without interfering noises, if you can't get good reception on stations that are drowned out by static on your old aerial, you need not pay us a red cent for this test. Send coupon at once for scientific explanation of Aer-O-Liminator (Ground Antenna) proof of performance and our conclusive iron-bound guarantee and remarkable Free Trial Offer—Mail Coupon TODAY!

Curtan Mfg. Co.,
154 E. Erie St., Dept. 805-T, Chicago, Ill.

Aer-O-Liminator

(Ground Antenna)

Rush This Important Coupon

Curtan Mfg. Co.,
154 E. Erie St., Dept. 805-T.
Chicago, Ill.

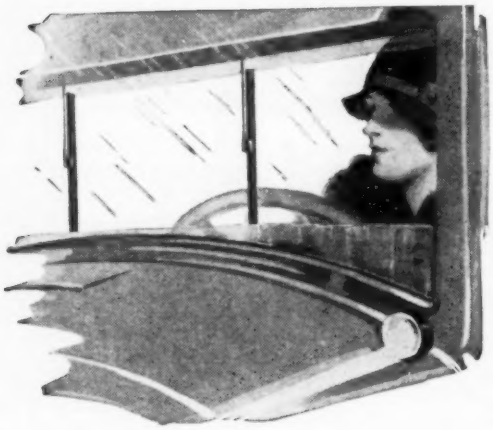
Please send me at once complete description of Aer-O-Liminator with details of guarantee, Scientific Proof and FREE TRIAL OFFER.

Name.....

Address.....

City.....

State.....



NEW TWIN BLADE CLEANER WIPES YOUR WINDSHIELD STRAIGHT ACROSS . . . $8.50

CRYSTAL clear vision for driver and passenger! A powerful, noiseless motor, driven automatically by the well-known suction principle, equipped with two vertical blades which slide smoothly back and forth, *clearing your whole range of vision.*

The Visionall clears 254 square inches of glass—more than twice as much as the average cleaner!

Blades do not swing in a half circle, but wipe straight across, allowing the water to run freely down off the end of each blade. One model fits all cars. Easily installed.

If your dealer can't supply the Visionall, we will mail one postpaid for $8.50. Trico Products Corporation, Buffalo, N.Y. *World's largest makers of windshield equipment.*

TRICO
VISIONALL

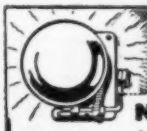
TRICO PRODUCTS CORPORATION, BUFFALO, N. Y.

As advertised in Popular Mechanics, please send me one Trico Visionall with instructions for installing. I enclose draft or money order for $8.50. I have written my dealer's name in the space below.

Name .....

Address .....

Dealer's Name .....



Protects Life and Home

NEVER-FAIL ALARM

warns away prowler and sneak-thief from home, garage, barn or chicken house. Patented, guaranteed signal bell rings 2 minutes when doors or windows are tampered with. NOT ELECTRIC. No upkeep expense. Quickly installed. Mounts in small space. Handsomely finished in oxidized copper or nickel. Door or window style in either finish.

AGENTS MAKE BIG PROFITS DEMONSTRATING

$1.50 Post Paid

THE AKRON ALARM CO., Dept. 14, Kenmore, O.

Cal. 30-40 6 Shot

$9.75

KRAG CARBINE—Why Pay More?

All the qualities of a high price rifle. The choice of those who know. Fine used condition, all working parts guaranteed for one year. Send for our Free 50-page catalog of money saving values; Guns, Ammunition, Cutlery, Sports and Gov't goods. Outfitters for 50 years to leading Military and Society Organizations, Theatrical and Wild West Shows. Satisfied customers all over the world. Terms Cash. No C.O.D.

W. STOKES KIRK, 1627-P. M. 10th St., Philadelphia, Pa.

BIG VALUE FOR 10 CTS.

6 songs, words and music; 25 Pictures Pretty Girls; 40 Ways to Make Money; 1 Joke Book; 1 Book on Love; 1 Magic Book; 1 Book Letter Writing; 1 Dream Book and Fortune Teller; 1 Cook Book; 1 Base Ball Book, gives rules for games; 1 Toy Maker Book; Language of Flowers; 1 Morse Telegraph Alphabet; 12 Chemical Experiments; Magic Age Table; Great North Pole Game; 100 Conundrums; 3 Puzzles; 12 Games; 30 Verses for Autograph Albums. All the above by mail for **10 cents,** and **2 cents** postage.

ROYAL SALES CO., Desk 519, Norwalk, Conn.

ENCYCLOPÆDIA BRITANNICA

in the New Form—at a saving of 40%
Write for full details. Address Dept. PM
THE ENCYCLOPÆDIA BRITANNICA, INC.
342 Madison Ave., New York City

The Quick Way to Music

KING Band Instruments offer you the quickest, easiest way to learn music—to play brilliantly.

They are *unqualifiedly guaranteed in writing* to be perfect in design, materials, mechanism and workmanship. That's why they'll help you to learn faster and play better.

When a great musician like Edwin Franko Goldman says that King Instruments greatly improved the tone and intonation of his famous band, that's proof that a King will insure *your* musical success.

Start now! Tell us the instrument you want. We'll ship it to you to try—FREE. The price will be no more than you'd pay for a less perfect instrument. Deferred payments will make payment easy.

Why handicap yourself? You can afford to own a King—the instrument of *guaranteed superiority.* Mail the coupon Today for our Handy Reference Catalog and other interesting booklets.

KING
BAND INSTRUMENTS

The H. N. White Co.
5211-94 Superior Ave., Cleveland, O.

Please send me free copy of "The White Way" Magazine and your Handy Reference Catalog.
(Check, below, instrument preferred.)

Name ..... Age ....
Address .....
City ..... State .....

☐ Saxophone ☐ Trumpet ☐ Trombone ☐ Alto
☐ French Horn ☐ Baritone ☐ Bass ☐ Bugle

LYNCH RESISTORS

5 Tube De Luxe Deck

Build any 5 tube circuit simply and inexpensively with this new deck. All mounted ready for wiring. Improves appearance and performance. Choose your own circuit and component parts. Price $12.50.

LYNCH Complete Resistance Line

Lynch Resistors have been specified by many leading experts for season's best receivers. Increasingly popular because of accurate, permanent, noiseless performance. When buying resistors say "Lynch."

The LYNCH Book

"Resistance the 'Control Valve' of Radio" explains uses and value of resistance in radio. Interesting, simplified language and illustrations. Information worth dollars—for a quarter. Send for copy today.

Arthur H. Lynch, Inc.
1775 Broadway at 57th Street
General Motors Bldg., New York, N. Y.

Make this Amazing FREE TEST!

Will you prove at our risk that the famous GOLD WAVE AERIAL actually does the amazing things we claim? Will you test this triple gold-plated aerial 10 days and prove positively that it will GIVE YOU STATIONS YOU HAVEN'T BEFORE RECEIVED? BRING IN FAR GREATER DISTANCE! — IMPROVE TONE AND QUALITY MARVELOUSLY! This aerial of gold is filled with conductivity—it draws and is GUARANTEED to produce these remarkable results on any make radio set. 7 strands—gold triple plated—Aerial 100 feet long, installed in or outdoors like any other aerial.

Send No Money

If your dealer can't supply, send name and address. Pay postman only $4, plus few pennies postage. Use 10 days. If not amazed and delighted your money refunded at once. Learn at our risk why thousands of radio owners and even broadcasting stations use it with better results. All radio engineers recommend it. Now sold in all European countries. Don't wait!

LUXEM & DAVIS MFG. CO.
Dept. J-12, 6229 Broadway CHICAGO

Distributors JOBBERS—DEALERS

—AGENTS write for liberal discounts and generous proposition. Fastest radio seller in market. Exclusive territories.

No More "Leaking!"
The wonderful TUFGLASS ALL-WEATHER ANTENNA INSULATOR is sensation everywhere. Positively resists temperature changes. Cut out that grind and squeal! Stops leaking! Corrosion proof—element defying—91,000 volts high frequency resistance. Only 35 cents! Buy now and enjoy better reception than ever before possible.

NOW ART MODELS Ensco

2 and 3 foot Cone Speaker Kits

The same famous "Ensco", the original and World's Finest Loud Speaker Kits, now dressed up with Art Models which will delight the heart of the most fastidious. Two and three foot models to suit every need and condition. Guaranteed the equal of any manufactured loud speaker, regardless of cost. Anyone can assemble in less than an hour, no mechanical or radio knowledge needed.

2 foot Pedestal

The Three Foot Pedestal
Beautifully finished in polychrome, heavy metal base. Complete kit including pedestal. A practical, beautiful floor model.
Model F-175-36 - 17.50
In Canada - - 22.50

The Two Foot Pedestal
Equally as well made and as beautiful as the three foot model, but smaller. Ideal for use on top of set or on any other piece of furniture. Finished in Polychrome.
Model F-135-24 - 13.50
In Canada - - 17.50

Standard and Wall Kits
Wall Kits are supplied with hardwood frame for easy assembly, now available in either 2 or 3 foot sizes. Standard Kits identical with the wall kits, but without hardwood wall frame (you can make your own wall frame if desired) for use in building console, wall or book type speakers. Fully described in illustrated book. Either 2 or 3 foot sizes.

Standard Kits 2 or 3 ft. - 10.00
In Canada - - 11.50
Wall Kits 2 or 3 ft. - 11.00
In Canada - - 12.50

Demand the "Ensco"—go to your dealer, ask to hear the "Ensco," you will have a surprise in store for you. If your dealer hasn't been supplied send the coupon—our money back guarantee protects you.

Wall Model

ENGINEERS' SERVICE COMPANY

25 Church Street, New York — **75 Cornhill, Boston**
28 E. Jackson Blvd., Chicago — **331 Bay St., Toronto, Ont.**
144 Second Street, San Francisco

ENGINEERS' SERVICE CO. (Send to nearest address)

Send me

	U. S. Prices	Canada Prices	I am enclosing
2 foot Standard Kit	10.00	11.50	Check
3 foot " "	10.00	11.50	Money Order
2 foot Wall Kit	11.00	12.50	Cash (registered)
3 foot " "	11.00	12.50	Send C. O. D.
2 foot Pedestal Kit	13.50	17.50	(All shipping
3 foot " "	17.50	22.50	charges paid on
(Check which)			Standard and
			Wall Kits only.)

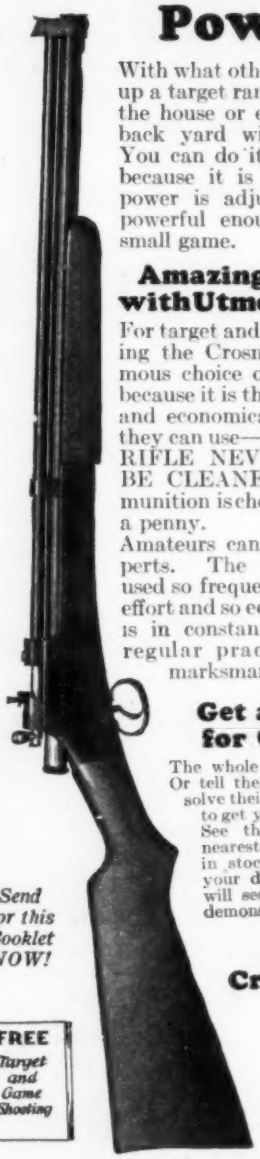
Name.....

Address.....

City..... State.....
P. M.

The CROSMAN .22 RIFLE

"Power Without Powder"



With what other rifle can you set up a target range in any room of the house or even fire it in the back yard within city limits? You can do it with a Crosman because it is noiseless and its power is adjustable, yet it is powerful enough for use with small game.

Amazing Accuracy with Utmost Economy

For target and small game shooting the Crosman is the unanimous choice of knowing people because it is the most convenient and economical .22 calibre rifle they can use—THE CROSMAN RIFLE NEVER NEEDS TO BE CLEANED—and the ammunition is cheap—five shots for a penny.

Amateurs can soon become experts. The Crosman can be used so frequently with so little effort and so economically that it is in constant use. Continued regular practice makes the marksman.

Get a Crosman for Christmas

The whole family will enjoy it. Or tell them about it and let it solve their problem of what gift to get you.

See the Crosman at your nearest dealer. If he has none in stock write us giving us your dealer's name, and we will see that he gets one to demonstrate to you.

Send for this Booklet NOW!

FREE *Target and Game Shooting*

The New Crosman Pell

Greater accuracy and more killing power

CROSMAN ARMS CO.
385 St. Paul Street
ROCHESTER NEW YORK

Ethyl is best for *cold* weather, *too*

Your car needs Ethyl Gasoline this winter.

You need Ethyl's *extra* power to negotiate roads that are muddy and snowy and slushy . . . to keep in high and get away faster in winter traffic . . . to reduce engine strain . . . and, most of all, to "knock out that 'knock'."

The ingredient in Ethyl Gasoline — tetraethyl lead — which made Ethyl the best summer fuel makes it best for cold weather too. *It's the superior high-compression fuel for all seasons.* And if you have one of the new high compression engines, Ethyl will give you a still greater thrill.

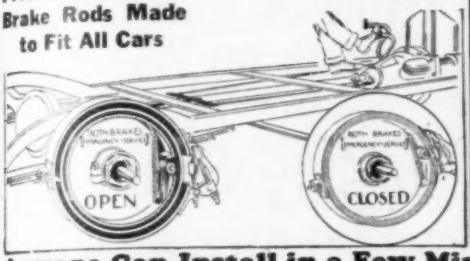
Ride with Ethyl the year round. This improved motor fuel is on sale at thousands of pumps throughout the United States and Canada which display the "ETHYL" emblem shown above. Fill your tank today.

ETHYL GASOLINE CORPORATION
25 Broadway, New York City

ETHYL GASOLINE

Price includes New Brake Rods Made to Fit All Cars

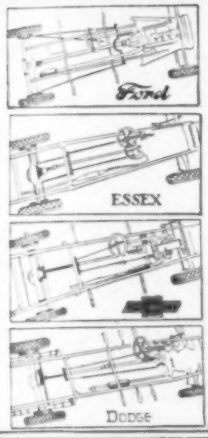
FITS ALL CARS



Now "YOU" Can Put 4 Wheel Brake Power on "YOUR CAR"

Anyone Can Install in a Few Minutes on Any 2 or 4 Wheel Brake Car

POSITIVELY THE MARVEL OF THE AUTO AGE



Wonders never cease—and here is the sensation of the year! JUST THINK—a simple idea that has been overlooked all these years and now is boiled down to a device that anyone can easily attach to their own car in a few minutes—and from that day on your car stops with a feeling of SAFETY—without undue strain—Stops your car almost on a straight line. Triples the Life of Brake Linings, as—

The Super Brake Device Equalizes Pressure on Both Sides of Each Brake Drum

The SUPER BRAKE DEVICE puts real 4 wheel brake power on cars with 2 brakes and puts 6 wheel brake power on cars with 4 wheel brakes. The minute your foot touches the brake pedal, you feel that security of good brakes without the continuous worry of damage to other cars and property as well as your own car—Then there is always that danger (with weak brakes) of hitting pedestrians mostly caused by brakes failing to respond promptly.

LIMITED SPECIAL OFFER . . $4.98

Stops Skidding — Acts Instantly

You must experience this NEW SUPER BRAKE DEVICE; that smooth yet forceful stop without skidding in all kinds of weather and wet streets—Relieves the pressure on the axle and shaft—The Greatest Brake Device Ever Invented—almost unbelievable stopping power on any level road; up or down grade; forward or backward—and if necessary will stop "on a dime."

AGENTS $1500 a Month

SUPER BRAKE DEVICE
1929-C, Straus Bldg., Chicago, Ill.

SUPER BRAKE DEVICE,
1929-C, Straus Bldg., Chicago, Ill.
Gentlemen:—Enclosed find remittance of $4.98, kindly rush to me one SUPER BRAKE DEVICE for my.....Car, Model..... It is understood that my money will be refunded if I am not well pleased.
☐ Mail me FREE particulars only.
☐ My County is.....
Name.....
St. or R. F. D.....
City.....State.....

FREE: Blue Prints Show You How To Make Things For The Home

NOW YOU CAN SAW EASILY and ACCURATELY

5 TOOLS IN 1: A Mitre, Saw Guide, T-Square, Protractor, and Precision Tool

The Harmak Saw Guide Shows You How. Everyone can now do their own carpentry work—picture framing, garden seats and ornaments, shelving, cabinets, etc. No tool kit complete without one.

Make Money at Home Doing Things

Don't ruin good lumber. Use a Harmak Guide. Operates anywhere. If your hardware or department store does not handle, order direct or write us for folders.

$30 Worth of Tools for Only (Special) $2.50

One-Half of any Carpenter's Outfit

HARMAK MFG. CO., 635-E Delmonte Way, St. Louis, Mo. *Regular Price $4.00*

Still Greater Bargains in Boice Machines

You can completely equip your shop with the latest Boice-Crane machines at their surprisingly low prices. Large capacity. Strong. Sturdy. Speedy. Economical.

14" Band Saw
Table 12"x14" tilts 45 degrees. Saws 7" stock. Uses blades 3/8" to 1/2" wide. Bronze bearings. Ball bearing roller guides.

8" Bench Lathe
Does turning, drilling, sawing, sanding, grinding, and jig sawing in wood or soft metal. Swing 8". 19" center to center.

Universal Handisaw
Table 15"x17" elevates for grooving. Tilts 45 degrees for bevelling. Swings 9" saw; cuts 2¼" stock. Guides always remain parallel to saw regardless of elevation or tilt of table. No other saw of equal cost has this indispensable and mechanically correct feature. Jointer attachment quickly fits on right of table. Other new low cost attachments will plane boards to thickness, mortise, shape, bore, tenon, drum sand, grind, disc sand, rout and make mouldings.

JIG SAW BARGAIN AT $11.00
Ideal for home shop, yet practical and sturdy enough for manufacturers use. Stroke 1½". Saw to frame 8". Capacity 1½" stock. Uses blades 1-8" to 3-8" wide. Net weight 18 lbs.

All Boice machines driven from light socket attachment. Send 10 cents for 64-page booklet, "Making It Easy to Build Things of Wood," which completely describes Boice-Crane Machines.

W. B. & J. E. Boice, Dept. P.M. 12-C, Toledo, Ohio

DAVEN AMPLIFICATION

Still the Superior Audio Amplifier

Use it in the Economy Nine and all other circuits

After three years, Daven Amplication is still the most faithful audio amplifier. No matter what your favorite circuit Daven Amplification will improve it. Only with Daven can you get absolutely straight line amplification over the entire audiable range. No motor boating on good "B" Eliminators.

Daven Amplification is now engineered for either AC or DC Tubes, for use with "B" Eliminators or Batteries. With AC operation, the new Daven AC-15 Tubes are used in the first two stages and an AC-10 or Mu-6 in last stage.

GLASTOR

THE *TRANSPARENT* RESISTOR

Glastor, made only by Daven by secret process makes the glass itself conductive. Glastor cannot change in value, cannot become noisy while the glass remains intact.

Make your last change

Replace your resistances now, it will be the last change as long as the set is in use. Glastor is made in a full range of values.

The DAVEN BALLAST

Good for life

The Daven Ballast, the Standard Filament Control will not burn out. Good for life of the set. Made in 5 sizes to control from 1 to 6 volt tubes. Sold with or without special mounting as shown.

Free Catalog at your dealer or sent direct upon request.

The Sine of Merit

DAVEN RADIO CORPORATION

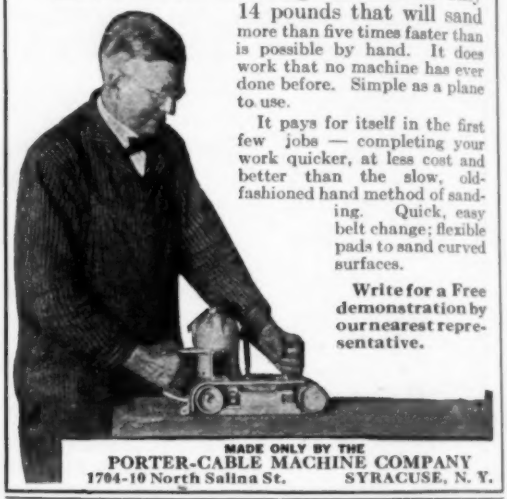
TRADE MARK *"Resistor Specialists"* REG. U.S. PAT. OFF.

153 SUMMIT STREET NEWARK, N. J.

How do you do your work on WOOD?

—the same as your granddad did OR with a

TAKE-ABOUT Sander



Here is a belt surfacing machine of only 14 pounds that will sand more than five times faster than is possible by hand. It does work that no machine has ever done before. Simple as a plane to use.

It pays for itself in the first few jobs — completing your work quicker, at less cost and better than the slow, old-fashioned hand method of sanding. Quick, easy belt change; flexible pads to sand curved surfaces.

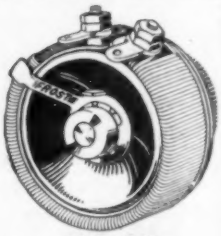
Write for a Free demonstration by our nearest representative.

MADE ONLY BY THE
PORTER-CABLE MACHINE COMPANY
1704-10 North Salina St. SYRACUSE, N. Y.

FROST-RADIO

DE LUXE APPARATUS

Ask your dealer to show you the new Frost Metal Frame and Bakelite De Luxe Rheostats, with and without filament switches; the new Frost Variable High Resistance Units, with Bakelite shells and pointer knobs; the new Frost Gem Rheostats—they are GOOD small rheostats—and the new Frost Fixed Resistances. The latter cost but a few cents, but they make a tremendous difference in the operation of your set. Be sure to specify Frost Parts by name when ordering.



TWO NEW FROST BOOKS FREE

Write today for your copy of our two new books, just off the press: "What Set Shall I Build?" and "Better Reception." These books contain a great deal of valuable information on popular circuits, and on the use of Frost Parts in getting the utmost in high quality reception from any set you plan to build. These books are free—write for them today.

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New York Philadelphia Chicago Los Angeles
Boston Pittsburgh St. Louis St. Paul

This Marvelous Tool! Pays $1000 a Month

No other wrench like it!

AN IDEAL XMAS GIFT

The First and Only "One Hand" Monkey Wrench

No Thumb Screw Adjustment—That simple slide motion locks securely with a hold that resists over 750 pounds end pressure. Compare this with any other wrench. Does away with the old thumb screw idea that was always a handicap. In every sense a "One Hand Monkey Wrench."

Slides Up and Down—Locks Automatically

The H&E Wrench creates a sensation wherever shown. Its simplicity, smooth action, strong grip and practical value arouses interest everywhere. In the Factory, Machine Shop, Garage, on the Farm, or in the Home; in fact, wherever tools are used—they all go wild over it.

Mechanics Wild Over It

Any mechanic readily appreciates the greater convenience and efficiency of the H&E Wrench and wherever shown they are anxious to own one. As one mechanic puts it, "I don't see how I ever could do without the H&E Wrench." That simple slide motion gets their eye and it locks with a better grip and releases instantly.

500 Agents Wanted at Once

Rapid sales with a handsome profit make this a very attractive proposition for Agents, and on account of this unusual demand we want agents everywhere and the opportunity is open to you NOW but you must ACT PROMPTLY.

Pressure 8000 Inch Pounds

All tests passed Government Specifications. Actual service and endorsement of Railroads assures High Class Practical Value.

GET YOURS FREE

This Is Your Opportunity

Think of the big sales possibilities right in your locality and surrounding territory—even if you never sold anything in your life before, we show you how to be successful. In fact, under our plan you even get your H&E Wrench FREE.

Praised by Big Concerns

The C. B. & Q. Railroad and many other large Corporations have acknowledged its value and endorsed it. Automobile Owners want it for convenience and our Agents tell us "It is the easiest selling article they ever tackled."

H&E WRENCH SALES CORP.
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H&E WRENCH SALES CORP.,
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Gentlemen:—
Please mail me FREE particulars. This does not obligate me in any way.

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SPEED LATHE $10.50

complete as shown. 7" swing, 24" metal bed, 3 speed cone pulley. Longer bed $1.00 per additional foot.

JEFFERSON MFG. CO., Fairfield, Iowa

KNICKERBOCKER 4 The Wonder Set

2-DIAL KARAS EQUAMATIC 5-Tube Receiver

These two famous receivers as well as scores of other well known sets owe no small part of their marvelous performance to the use of Karas parts. Karas Condensers, Transformers, Filters, Coils and Dials are the perfected products of a factory which has been building precision electrical apparatus for more than a third of a century. **Write today for complete catalog of all Karas Parts, and details of the Knickerbocker 4 and the 2-Dial Karas Equamatic.**

KARAS Electric Co. 4028-L No. Rockwell St., Chicago

2-DIAL KARAS EQUAMATIC USE KARAS PARTS KNICKERBOCKER "4"

NEW VEST POCKET ADDING MACHINE

Guaranteed

ADDS, SUBTRACTS, MULTIPLIES, DIVIDES

Does work of $300 machine. Guaranteed 5 years. NOT A TOY.

Made of steel and indestructible. Million dollar capacity. Fits in pocket. Will not make mistakes. So simple child can operate it. Instructions furnished. Everybody should carry one for figuring.

FREE TRIAL **$2.50** Total Cost

SEND NO MONEY—Just name and address. We will ship Calculator immediately. On delivery pay postman $2.50 (Plus few cents Postage). (If outside U. S. send cash). 10c additional in Leatherette Case. If not satisfied after 10 day trial you get your money back. THOUSANDS OF SATISFIED USERS.

This is lowest priced practical calculator made. "Why pay more for inferior imitations?" Order from this ad.

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☐ I am enclosing $2.50—send adding machine prepaid.

☐ Send Adding Machine C. O. D. $2.50 plus postage. (10c additional in Leatherette Case)

Name.....

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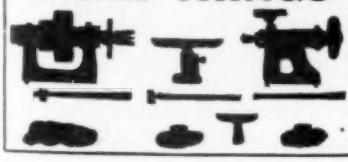
City.....State.....

AGENTS Write for big commission and territory proposition.

MAKE THINGS AT HOME—SAVE MONEY



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Buy the finished parts completely assembled. Build bed at home. A real tool. 6" swing. Shipping weight 21 lbs. Make radio parts, floor lamps, toys and numerous other practical and valuable articles. Also made in sizes to swing 8", 11", 13", 16", diameters.

$13.50 f. o. b. Chicago

IDEAL GIFT FOR FATHER OR SON

Send today for descriptive circular.

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Suppose You Were Offered Diamonds at 60% of Market Price

Suppose a reason you rarely think of makes possible here radically **low prices, even for finest quality diamonds.** Thousands of representative people, bankers, lawyers, merchants, others—continually reap this real advantage. Everything sent for Free Examination. This 3/4 century, oldest, largest diamond banking institution in the world, rated over $1,000,000.00,—**converts into cash the diamonds on which money was loaned and not repaid.** Loan values, a fraction of market values, are the price basis. Diamonds too from big cash deals direct with European cutters. Must sell *now*

Why Pay Full Prices

When Much Less Buys the Same

See this 3/4 less 1/16 ct., snappy solitaire for $69.50. Try to match at $115.00. Examine free any bargain at our risk. Startling, legitimate offers here of diamonds at 60% of market price. Send now for full details. Diamonds of unusual qualities (also watches) from unpaid loans, offered at radically low prices based on mere loan values. Then, too, we have hundreds of diamonds from big, cash, European deals with diamond cutters, who sacrificed these gems away under the market. Send now for our latest offers of this internationally known cash headquarters.

Unpaid Loan Listings Ready

As low as $60 a Carat

Radically different from a catalog. List accurately describes every diamond in full detail with guaranteed exact weight, color, quality, etc. Explains **Guaranteed Cash-like Insurance Policy Loan guarantee.** Also **Unlimited Exchange** privilege at price paid us. Gives full details of free examination offers. Don't wait, the very diamond you want may be in this very list at a price that will amaze you. Costs nothing to see. Write today. A postal will do, or— ***Mail Coupon NOW!***

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Only Opposite Postoffice
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Without obligation to buy, send me free, in plain envelope, your Latest Bargain List of Diamonds, Watches, and other Jewels.

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References by Permission:—Bank of Pittsburgh, N. A.; Marine National Bank; Union Trust Co., Pittsburgh, Pa. Your bank can look us up in the mercantile agencies.

JOIN THE RADIO ASSOCIATION

Your Neighbors Will Pay You $75.00 a week for Your Spare Time

You can easily sell them your spare hours for $3 each by serving as "radio doctor," building them sets, selling them supplies at less than retail. A membership in the Association shows you how to cash in on Radio now and trains you for the $3,000 to $10,000 openings awaiting qualified men. The Association starts you in business if you wish. Investigate all it has done for others, all it can do for you. A MEMBERSHIP NEED NOT COST YOU A CENT.

Earned $500 in Spare Hours

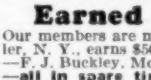
Our members are making big money with Radio. Werner Eichler, N. Y., earns $50 a week—Lyle Follick, Mich., has earned $500—F. J. Buckley, Mo.—makes as much as he receives from employer—**all in spare time.** Our members are starting radio stores, getting better positions, increasing their salaries, earning money spare time.

ACT NOW—for No-Cost Membership

Send post card for details of Special Membership Plan that need not—should not—cost you a cent, and our book, "Your Opportunity in the Radio Industry." It will show you how you can cash in on Radio now—and later.

Radio Association of America
4513 Ravenswood Ave., Dept. PM-12, Chicago, Ill.

RADIO **GREATEST RADIO BARGAIN in U. S. 5-Tube Chassis $18.45**



Coast to coast reception. Certified circuit. Dealers write for special proposition. AGENTS WANTED. Write today for folder.

A. J. MUSSELMAN, Inc.
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Here It Is Boys! Look It Over

R. O. Gosden of Michigan made $321.05 in 9 days—sold 5 machines in 2½ hours.

THE EUREKA ADVERTISER
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Automatically prints the merchants' "ADS" on his wrapping paper in one or two colors. Costs only what it costs to have "AD" printed on twenty rolls of paper. Flint of New York sold four machines in two hours. You collect and keep your commission. We deliver. Every merchant a prospect. Many buy five or more machines—one for each paper rack they use.

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CLAROSTAT

IMPROVE YOUR RADIO SET!

In making your radio set better, or building a better radio set, you will generally find Clarostat specified. Radio authorities know that Clarostats provide the necessary resistance range, hold their settings, introduce no noises, and are dependable. There are three types of Clarostats—Clarostat Variable Control, for receiving circuits only; Standard Clarostat, for voltage control of radio B-power units; Power Clarostat, for series filament, line-voltage, and transmission controls.

Don't substitute, intentionally or otherwise! The Clarostat, as the standard variable resistor, is widely copied in appearance, but hardly in performance. Look for the green box. See that the name is stamped on the Clarostat itself.

Ask your radio dealer for Clarostats. Watch the radio columns for data on how to better your radio. Or write us direct for latest information.

MEMBER R.M.A.

American Mechanical Laboratories, Inc.
Specialists in Variable Resistors
285 North 6th St. Brooklyn, N. Y.

A&B Battery Charger ONLY $2

SATISFACTION GUARANTEED

Charges any type of storage A or B battery, using a few cents worth of ordinary house current, either alternating or direct. Cannot injure battery. Complete directions enclosed. Anyone can operate. No expensive "extras" to buy. Why pay $10.00 to $15.00 for a charger when you can get this splendid GUARANTEED R. B. Charger by mailing us two dollars (bills, money order, check or stamps) plus ten cents in stamps or coin to pay mailing costs. Charger will be sent postpaid. If you are not satisfied, return within five days and we will refund your money. Order at once—TODAY.

R. B. SPECIALTY CO.
Dept. 601-S East Third St., Cincinnati, O.

MAGNIFICENT TONE~SUPER SELECTIVE~POWERFUL DISTANCE GETTER

All Electric or Battery Set

Big Discounts to User-Agents

America's big, old, reliable Radio Corporation (8th successful year) **guarantees** in its big, powerful, latest 6, 7 and 8 tube Miraco sets "the finest, most enjoyable performance obtainable in **high grade** radios." Unless 30 days use in your home fully satisfies you a Miraco is unbeatable at any price for beautiful, clear cathedral tone, razor-edge selectivity, powerful distance reception, easy operation, etc.—**don't buy it! Your verdict final!** Save or make lots of money on sets and equipment — write for testimony of nearby users and **Amazing Special Factory Offer.**

Miracos work equally fine on "AC" electric house current or with batteries. Take your choice. Many thousands of Miraco users — who bought after thorough comparisons — enjoy programs Coast to Coast, Canada to Mexico, loud and clear — with the magnificent cathedral tone quality of costliest sets. Don't confuse Miraco's with cheap, "squawky" radios. Miraco's have finest parts, latest approved shielding, metal chassis, etc.—as used in many $200 sets.

DEAL DIRECT WITH BIG FACTORY

Your Miraco reaches you completely assembled, rigidly tested, fully guaranteed. Easy to connect and operate. **30 days trial free.** 3 year guarantee if you buy. You take no risk, you insure satisfaction, you enjoy **rock-bottom money-saving prices by** dealing direct with one of radio's oldest, most successful builders of fine sets. 8th successful year.

MIRACO "Powerplus" sets—8 and 7 tube models—have magnificently beautiful, clear cathedral tone quality. Turn one dial for stations everywhere. Ultra-selective. Latest all-metal shielded chassis. Illuminated dial. Fully guaranteed. Try one **free for 30 days!** Big selection of beautiful cabinets.

Dealers Write! **USER-AGENTS! Make big profits showing Miracos to friends. Get Our Special Wholesale Prices!**
MID-WEST RADIO CORPORATION, Cincinnati, O.

BEAUTIFULLY ILLUSTRATED CATALOG AND AMAZING SPECIAL OFFER

Free!

SEND NO MONEY—30 DAYS' TRIAL, Special Wholesale Price Offer to User-Agents, Bank References, testimony of nearby Miraco users —*all the proof you want*—sent with catalog.

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Electrify Any Radio with MIDWEST NO-BATTERY "AC" Light Socket Power Units

"A" "B" and "C" power, direct from light socket, without batteries! Write for Midwest prices and discounts. Units are highest grade—lastingly dependable, quiet in operation, fully guaranteed. Mail coupon!

ANOTHER BIG BARGAIN! Famous powerful big Miraco Super 6, 1928 model—ultra selective! Thousands find it outperforms sets of much higher price. **30 Days' Trial Free. Fully Guaranteed.**

MIDWEST RADIO CORP'N
Pioneer Builders of Sets
407-G Miraco Bldg., Cincinnati, Ohio.

THIS COUPON IS NOT AN ORDER

WITHOUT OBLIGATION, send me free literature, AMAZING SPECIAL WHOLESALE PRICE OFFER, testimony of nearby users, etc.

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LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night The very latest discovery in the scientific world. Hitherto, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, applied to the surface of any article, **emits rays of white light, rendering it perfectly visible in the dark. THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES.** Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crucifixes, Luminous Rosaries, etc. Small bottle, **price 25c.** Larger **sizes, 50c and $1** postpaid. **JOHNSON SMITH & CO. Dept. 816 RACINE, WIS.**

CIGARETTE MAKER

Roll your own and save money. Better and quicker; saves more than half. Use your favorite brand of tobacco. Neat, useful, handy. Pocket size, weighs ½ oz. Made entirely of metal, nickel plated. **25c, 3 for 65c postpaid anywhere.**

GOOD LUCK RING

Very striking, quaint and uncommon. Silver finish; skull and crossbones design, two brilliant, flashing gems sparkle out of the eyes. Said to bring good luck. **Only 25c ppd.**

Exploding Cigarettes

JUST LIKE ORDINARY CIGARETTES. BUT SUCH REAL STARTLERS! The box contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third smoked, the victim gets a very great surprise as it goes off with a loud BANG! A great mirth provoker yet entirely harmless. **Price 25c box.**

NOVELTY BADGES

Kissing Permit 10c *Garter Inspector 10c*

Two very novel metal badges, nickel plated, that you can wear, giving you fun out of all proportion to their trifling cost. **10c, each badge, 3 for 25c, or 75c per doz. postpaid anywhere.**

SURPRISE MATCHES

More fun than fighting with your wife. Look just like ordinary matches. Put up in boxes just like regular Safety Matches. As the victim tries to light one he gets quite a surprise. **Price 10c per box, 3 boxes for 25c, 12 for 75 cents.**

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GREAT CURIOSITY Smallest Bible in the World. Size of a postage stamp. **200 Pages.** Said to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Make good money selling them to friends, church acquaintances, etc. PRICE **15c** each, **3** for **40c, 12** for **$1.35, 100** for **$7.90.** Also obtainable in Leather Binding, with gold edges. **Price 50c each, 3 for $1.25, $4.80 per doz. Magnifying Glass** for use with Midget Bible, **15c.**

These clever locks cannot be opened unless you know the combination. No key necessary. For your locker, bicycle, tool chest, mail box, thousands of uses. Shackle and tumblers nickel plated. Weighs trifle over one ounce. Small yet strong. Secret and full instructions with each lock. **Price 25c or 3 for 65c postpaid.**

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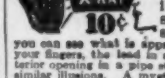
With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. **Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 thousand postpaid.**

Wonderful X-Ray Tube



A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. A mystery that no one has been able to satisfactorily explain. **Price 10c, 3 for 25c, 1 dozen 75c. Johnson Smith & Co.**

MAGIC FLUTE

Post Paid 25c

The Magic Flute, or Humanatone, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it which, when once acquired after a little practice, will enable you to produce very sweet music that somewhat resembles a flute. There is no fingering, and once you have mastered it you can play all kinds of music with facility and ease. When played as an accompaniment to a piano or any other musical instrument, the effect is as charming as it is surprising.

Every Boy His Own Toy Maker

A great book for boys. It gives plain, practical instructions for making all manner of toys, machines and other articles, amusing and useful. Tells how to make a Steam Engine, a Photographic Camera, a Windmill, Microscope, Electrical Machine, Galvanic Battery, Electric Telegraph, Electrotyping Apparatus, Telephone, Kaleidoscope, Magic Lantern, Aeolian Harp; how to make Boats of all kinds, Kites, Balloons, Paper Toys, Masks, Card Tacks, Wagons, Carts, Toy Houses, Bows and Arrows, Peg Guns, Slings, Fishing Tackle, Rabbit and Bird Traps, etc. 200 illustrations. PRICE 25c POSTPAID.

Serpent's Eggs

Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which curls and twists about in a most life-like manner. **Price per box, 10c postpaid, 3 for 25c.**

JOHNSON SMITH & CO.

Dept. 816 **RACINE, WIS.**

A De Luxe Edition of our new 1928 CATALOG mailed on receipt of 25c. Handsome binding. Bigger and better than ever. Only book of its kind in existence. 550 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., unprocurable elsewhere. Remit by Stamps, Coin, Money Order, Check, etc. Unused U. S., Canadian and Foreign Stamps also accepted.

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps, & Dogs

Special Offer 1 Blank Cartridge Pistol 100 Blank Cartridges 1 550-page Novelty Catalog **ONLY $1.50** The Lot Shipped by Express Only Cash With Order Only

Well made and effective, modelled on the latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard .22 Cal. Blank Cartridge — obtainable everywhere. **Special cash with order offer:** 1 Superior quality Blank Cartridge Pistol, 100 Blank Cartridges, and our new 550 page De Luxe Catalog of latest novelties; all for **ONLY $1.50.** Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. Special Holster (Cowboy Type) for pistol 50c. No C.O.D. shipments

THROW YOUR VOICE

Into a trunk, under the bed or anywhere. Lots of fun fooling the teacher, policeman or friends.

THE VENTRILO

a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it.

Never Fails. A 16 page course on ventriloquism, the Ventrillo, ALL FOR 10 CENTS

PISTOL, OPERA AND FIELD GLASS

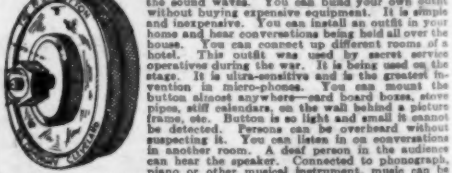
9 In One

It is made in the shape of and looks like a regular Automatic Pistol. No one is likely to stop and ask you whether it is real or not. Thus it is likely to prove itself very handy in an emergency. On pressing the trigger it opens up as shown in the illustration at the right, revealing nine most useful articles—Opera and Field Glass, Telescope, Mirror, Magnifying Glass and Burning Lens, Reading Glass, Sun Dial, Sun Compass, etc. In the handle of the revolver there is a place for various pocket necessaries, such as First Aid Articles, Buttons, Pins, etc. The Pistol is of sheet metal, blued finish, that can be carried comfortably in pocket. **PRICE $1.00 postpaid.**

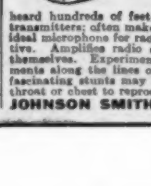
Watch Charm Pistol $1.75

Exact reproduction of a real pistol; actually fires REAL BLANK CARTRIDGES of miniature size. Illustration is actual size. 1¾ inches long, with ring at end for attaching to watch chain. Loads like a regular pistol. Pull the trigger and it goes off with a loud bang. Pistol is break open type; illustration shows position for loading. Made entirely of high grade steel, nickel plated, octagon barrel, handsomely engraved handles, complete in box with cleaning rod. **PRICE $1.75.** Also furnished with **pearl handles, $2.50. BLANK CARTRIDGES, 50c** per box of **25.** **JOHNSON SMITH & CO., Dept 816, RACINE, WIS.**

MICROPHONE TRANSMITTER BUTTON



$1.00 Postpaid



You can easily make a highly sensitive detectophone by using this Transmitter Button to collect the sound waves. You can build your own outfit without buying expensive equipment. It is simple and inexpensive. You can install an outfit in your home and hear conversations being held all over the house. You can connect up different rooms of a hotel. This outfit was used by secret service operatives during the war. It is being used on the stage. It is ultra-sensitive and is the greatest invention in micro-phones. You can mount the button almost anywhere—card board boxes, stove pipes, stiff calendars, on the wall behind a picture frame, etc. Button is so light and small it cannot be detected. Persons can be overheard without suspecting it. You can listen in on conversations in adjoining room. A deaf person in the audience can hear the speaker. Connected to phonograph, piano or other musical instrument, music can be heard hundreds of feet away. Button may be used to renew telephone transmitters; often makes an old line "talk up" when nothing else will. The ideal microphone for radio use; carries heavy current and is extremely sensitive. Amplifies radio signals. Countless other similar uses will suggest themselves. Experimenters find the button useful for hundreds of experiments along the lines of telephones, amplifiers, loud speakers, etc. Many fascinating stunts may be devised, such as holding the button against the throat or chest to reproduce speech without sound waves. **PRICE $1.00. JOHNSON SMITH & CO., DEPT. 816, RACINE, WIS.**

THE EXPO WATCH CAMERA

The most wonderful and ingenious Camera made

It is but little larger than a watch, which it closely resembles. You can carry the **Expo** about in your pocket and take pictures without any one being the wiser.

Less Than 2 Cents a Picture

The Expo loads in daylight with 10 or 20 Exposure Films, costing 25c and 35c respectively, and thus the picture taking part of a whole day's outing may be had for a very nominal sum — Little more than one cent a picture.

Price $3.60 Post Paid

Easy to Manipulate

It is simplicity itself to operate. Takes pictures through the stem, where the Rapid Fire Lens is located. The photos (1-5x7-8) may be enlarged to any size.

Operated as Quick as a Flash Time and instantaneous shutters; weighs but 3 ounces; nickel plated. Endorsed by amateurs and professionals the world over. Thoroughly practical—printing and developing of films just the same as ordinary cameras—in daily use by the police, newspaper reporters, detectives, and the general public. Important beats have been secured with the Watch Camera by enterprising reporters. Produces clear, sharp negatives indoors or outdoors equal to any camera on the market, size or price notwithstanding. **Sold Under a Positive Guarantee.**

Expo Watch Camera Price Post Paid $3.60 FILMS, 10 Exposures 25c, 20 Exposures 35c Leather Pocket Carrying Case, 35c

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks Enough for an Entire Evening's Entertainment

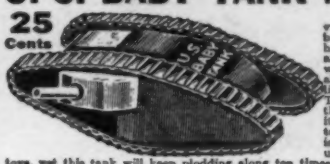
ANYONE CAN DO THEM $1.00

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket); The HINDOO TRICK CARDS (can be made to change completely no less than five times); DISAPPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination); The GLASS COBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth); the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE (no one but yourself is able to make it lay down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat), and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other feats and illusions are fully explained for which you can easily make or procure the necessary apparatus. **Price complete $1.00 postpaid, JOHNSON SMITH & CO.**

U. S. BABY TANK

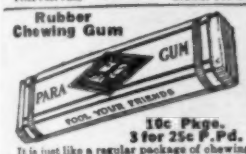
It goes with real Yankee Pep—by its own power

25 Cents



Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same lifelike manner as the larger Tank that proved so deadly in the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run for toys. It will perform dozens of the most wonderful stunts; it will go backward or forward at will; 2½ inches long. **Price only 25 cents prepaid.**

Rubber Chewing Gum



10c Pkge. 3 for 25c P.Pd.

It is just like a regular package of chewing gum and looks so real that it fools everybody. Of course no one suspects it is not genuine until they start to chew it. There's a world of fun in this rubber chewing gum—4 sticks to the package. **Price, 10c Pkge.; 3 for 25c; 12 for 75c postpaid.**

INVISIBLE INK

The most confidential messages can be written with this Ink, for the writing makes no mark. Cannot be seen unless you know the secret. Invaluable for many reasons. Keep your postals and other private memorandums away from prying eyes. Great fun for playing practical jokes.

Only 15c a Bottle; 3 for 40c.

BOYS' HAND CUFFS

65c

There is a great deal of wholesome fun and amusement to be derived from these handcuffs. Although merely a toy, they are well and strongly made, with extremely simple mechanism that can be slipped on and off in a moment. No key is required either to lock or unlock them. Just slip them over the wrists and you have your pal securely handcuffed. Those Handcuffs stand for Law and Order and, in the hands of the boy, inspire him with respect for Civic Virtues. They are entirely nickel-plated all over. **Price only 65c pair postpaid.**

POCKET CIGAR LIGHTERS

You may pay more, but these two Lighters will do the work as well as the most expensive. The **"SIMPLEX"** (illustrated on the left) sells for but **20c;** lights merely by giving the wheel a turn with the thumb. The "AUTOMATIC" (on right) lights automatically; press the button, the lid flies open and lights wick at same time. Better, safer and cheaper than matches. A light instantly available whenever you want it. **Price: Simplex Lighter 20c; Automatic Lighter $1.00; extra flints for either 5c each. All postpaid.**

Simplex Lighter 20c **Automatic Lighter $1.00**

Female SEX Indicator 25c Male

Sex Indicator

Hold the **MAGIC INDICATOR** over a man's hand—instantly it moves in a straight line, backward and forward. Hold it over a woman's hand and it describes a complete and continuous circle. The same action can be obtained over a letter written by a man or woman, etc. It is fascinating; baffling. We have never been able to figure out how it's done—but we've never seen it fail. Many novel and entertaining feats may be performed with the Sex Indicator. For example, similar results can be obtained with animals, cats, dogs, rabbits, over birds, chickens, canaries, etc. Also used to predetermine the sex of chickens and birds, etc. In fact it is sold as a patented egg tester in Europe. **Price 25c, or 3 for 65c, postpaid.**

RESURRECTION PLANT

One of the most wonderful plants known. Possesses the strange power of turning in a few minutes from an apparently lifeless, dry herb to a **BEAUTIFUL LIVING FERNLIKE PLANT** of a dark green color. Simply place the plant in saucer of water, it will open up and start to grow in 20 minutes. When taken out it will dry up and go to sleep until placed in water again. Fine house plant—summer or winter. **18 cents each or 3 for 25c., 75c per doz., postpaid.**

SCOUT KNIFE 50c

This Scout Knife has 4 Blades—1 Large Spear, 1 Combination Screw Driver and Cap Lifter, 1 Punch and 1 Can Opener. Imitation stag metal handle, equipped with shackle for belt or chain. Size closed 3½ inches. Wonderful value at the price. **Price 50c Postpaid.**

Comical Motto Rings

Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. **Price only 25c Postpaid.**

Great Fire Eater

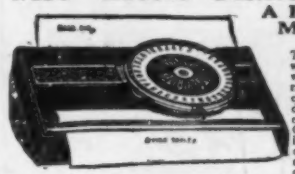
With the Fire Eater in his possession any person can become a perfect salamander, apparently breathing fire and ejecting thousands of brilliant sparks from his mouth, to the horror and consternation of all beholders. Harmless fun for all times, seasons and places. If you wish to produce a decided sensation in your neighborhood don't fail to procure one. We send the Fire Eater with all the materials, in a handsome box, the cover of which is highly ornamented with illustrations in various colors. **Price** of all complete only **30 cents,** postpaid.

SQUIRT ROSE 25c

A REAL STARTLER. This is the most popular of all squirt tricks. The flower in your coat looks so fresh and sweet that everyone is tempted to inhale the delightful perfume. Then is the moment to press the bulb. Gewhillikens. Don't they jump? There is a very long rubber tube that easily reaches to the pocket of your coat or trousers, and the bulb is large enough to make a dozen shots with one loading. **PRICE 25c each, or 3 for 65c postpaid.**

The "Little Giant" Typewriter

A First Class Writing Machine For $1.50



A perfect little typewriter for $1.50. There are thousands of persons who would like to use a typewriter but whose needs and business do not warrant the expense attached to the purchase and use of a fifty or seventy-five dollar machine. To such persons we confidently recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The letters of the alphabet most frequently used are so grouped as to enable one to write rapidly, the numerals 1 to 10, and the punctuation marks being together. With this machine you can send your best girl typewritten love letters, address envelopes, make out bills, and do almost any kind of work not requiring a large, expensive machine. With each typewriter we send a tube of ink and full printed instructions for using the machine. **Price complete $1.50 by mail postpaid to any address in the world.**

Send remittance (Postage Stamps accepted) for all articles listed on above and previous page to

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When you give an Ingersoll Watch you make a gift that is appreciated out of all proportion to its cost.

For there's no gift like a watch, nothing used so much, consulted so often, carried so long. And Ingersoll Watches, made for over 35 years, have a reputation for dependability and enduring service that is world wide and thoroughly deserved.

If your dealer hasn't just the model you want, write us giving his name.

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The new improved model. More closely cased, antique bow and crown. Always dependable and sturdy $1.50
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A WHOLE LIFE-TIME of joy is packed in a Conn saxophone. *You play tunes in a week.* Conn's easy-playing features and new instruction methods speed you along.

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7 tubes single dial —Solid Walnut Cabinet—Size 28" x13"x10"—Electrically lighted dial—Finest quality low-loss parts—Coast-to-Coast reception—3 YEAR GUARANTEE.

"Simply press the switch button and it's on"

Metrodyne

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B-Batteries
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NOW! A real electric radio set! Costs less than most battery sets. No batteries—no chargers—no eliminators—no acids—no liquids! Shipped direct from our factory at rock bottom prices and on 30 DAYS' FREE TRIAL.

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Make big money taking orders for Metrodynes. All or part time. Metrodyne All Electric Radios are in a class by themselves. Unequalled for quality, performance and price. Demonstrate at home and take orders. Lowest wholesale prices. Your demonstrating set on 30 days' free trial. Mail coupon below for details.

At last! The radio you've dreamed about! If you have electricity in your home you can now really enjoy **coast to coast** radio reception without the care, bother and must of batteries, chargers, eliminators, etc. The **Metrodyne All Electric** is a real, genuine **batteryless** radio set. Simply insert the plug in the socket, press the switch button and "tune in." You could not possibly buy a better radio set than the **Metrodyne All Electric**, no matter what price you paid.

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Costs Less Than Most Battery Sets

Do not confuse the Metrodyne electric radio with ordinary light socket sets. The Metrodyne is an **all electric radio**—uses less than 2c worth of power a day. Comes **direct from factory**. Its low cost brings it down to the price of an ordinary battery set. We are so confident that you will be delighted with this wonderful, easy-to-operate **batteryless radio** that we offer to ship it to you for **30 days' free trial**—you to be the judge.

We are one of the pioneers of radio. The success of Metrodyne sets is due to our liberal 30 days' free trial offer, which gives you the opportunity of trying before buying. Thousands of Metrodynes have been bought on our liberal free trial basis. Write Today!

Gorgeous Console Electric Radio

Genuine walnut cabinet, in a beautiful two-tone finish. Has a built-in genuine Metro-Cone large size speaker. Brings in programs with great volume, reproducing the entire range from the lowest to the highest notes with remarkable clearness and distinction. All metal parts finished in old gold. Wonderful electric radio, in cabinet that will beautify any home.

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Learn about the marvelous Metrodyne All Electric Radio before buying any radio set. Let us send you the proof of quality. Read the letters from thousands of owners. Get our rock bottom direct-from-factory prices and our liberal **thirty days' free trial offer.**

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Chicago, Illinois

Gentlemen:

Send me full particulars about Metrodyne All Electric Radio sets and your **thirty days' free trial offer.**

Name.....

Address.....

If you are interested in AGENT'S proposition place an "X" in the square. ☐

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Diamond Jewelry for Christmas!

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Solid 14-k white gold case, 15 Jewels. **$27.50.** $2.75 down **$2.75 a month**

Satisfaction guaranteed, or money back. Goods sent for your free examination on request. Credit terms: Pay one-tenth down; balance weekly, semi-monthly, or monthly at your convenience. All goods delivered on first payment.

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"To Be Successful, Look Successful"—own and wear a genuine Diamond!

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Two exceptional values in men's Diamond rings. Each ring is solid 18-k white gold, hand carved and engraved, set with a magnificent blue white Diamond. Order yours today!

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Men's strap watch, nickel, cushion shape, 6-jewel, high-grade movement, fine leather strap $8.50

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White gold filled, 20-Year Quality Case; 12 size; silver dial; assorted patterns, $23.50. $2.35 down and $2.35 a month.

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DEALERS Make More Money! Tie up with a house that carries large, complete stocks, that gives you the highest quality radio parts, that insures speedy shipments and 100% satisfactory service. Our wholesale vest pocket price list and discount sheet and catalog will be sent to you on request. **But Write Quickly.**

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Make a MOTOR CYCLE

of your BICYCLE. CASTINGS to build Motor or **FINISHED MOTORS.** Complete information, 10 cents. Blue prints of Drawings, 25 cents, coin. None free.

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No Other Compares With This

Improved Oil Burner

Use Ordinary Kerosene or Coal Oil

[Burns Outdoors as Well as Indoors]

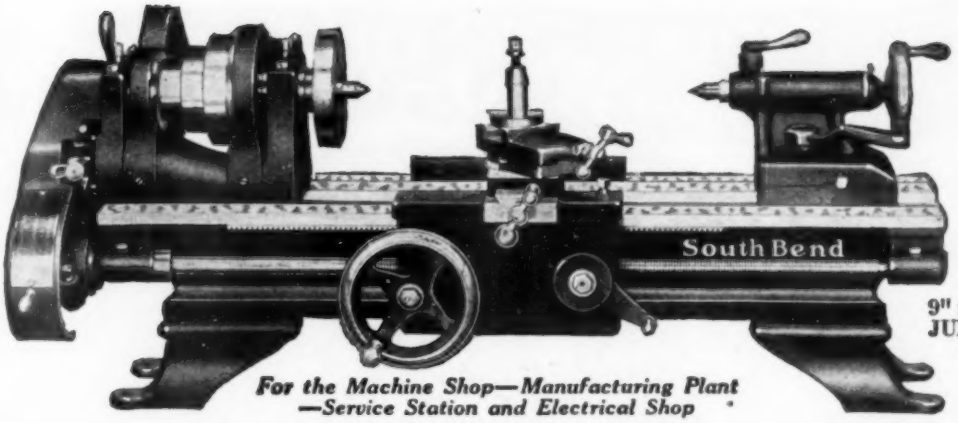
THE most remarkable Kerosene Burner ever built. Boils down apple cider, maple syrup, molasses, etc., in half the ordinary time. Ideal burner for dairies, butchers, indispensable on the farm.

PRODUCES TERRIFIC HEAT WITH SILENT BLUE FLAME

NO NOISE SMELL SMOKE SOOT

So efficient it produces twice the amount of heat of City gas at half the cost. So simple anyone can install and operate. Double generator assures continuous operation without shut-downs. Nothing to wear out, starts in a jiffy, will last a life time. Every burner guaranteed fully. Write for special introductory price and free catalog of outdoor utility and kitchen stove oil burners.

HOME MFG. CO., Dept. 1413, 18 E. Kinzie St., CHICAGO



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Only $150

The NEW MODEL—Back Geared—Screw Cutting Precision Lathe

Complete with Countershaft and Equipment

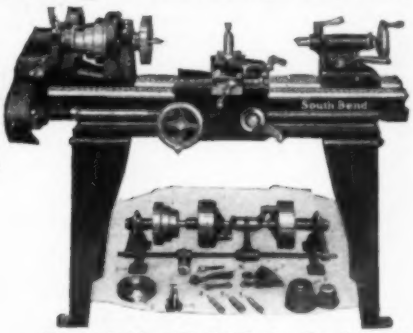
Easy Payments If Desired

This New Model 9" Junior South Bend Lathe is built in the same plant where 38,000 other fine Precision Lathes have been manufactured for the United States Government, Ford, Westinghouse, Bethlehem Steel Co., U. S. Steel Corporation, and hundreds of other large industries in the United States and 32 Foreign Countries. It is the world's greatest Lathe value.

Features and Specifications

Power Feed to Carriage
Set-over for Taper Turning
Hole through Spindle.....¾ in.
Spindle Speed.....48 to 714 R. P. M.
Width of Belt.....1 in.
Maximum Draw-in Collet Size.....½ in.

A number of attachments can be fitted to the Lathe for doing various classes of work.



9" x 2½' New Model Junior South Bend Lathe with floor legs, countershaft and equipment $160

Small Down Payment

Balance in 10 Equal Monthly Payments

A small down payment brings you the Lathe to use while you are paying for it. In this way it earns its own cost by the work it does and the savings it makes.

OTHER POPULAR SELLING SIZES
Complete with Countershaft and Regular Equipment

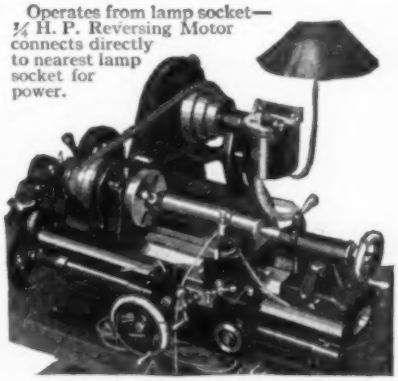
Size of Lathe	Shipping Weight	Standard Change Gear	Quick Change Gear
9"x 3'	490 lbs.	$235.00	$270.00
11"x 4'	725 lbs.	300.00	335.00
13"x 5'	1110 lbs.	352.00	402.00
15"x 6'	1550 lbs.	430.00	490.00
16"x 8'	2035 lbs.	510.00	570.00
18"x10'	2840 lbs.	685.00	750.00

The complete line ranges from 9 to 24-in. swing, and from 2½ to 16-ft. bed. Write for name and address of your nearest dealer.

Free New Booklet 22-K and Complete Catalog No. 88

Our new 20 Page Booklet 22-K describes the New Model 9" Junior South Bend Lathes in all types and drives—165 illustrations—sent free on request. Complete Catalog of all South Bend Lathes will also be mailed postpaid.

Operates from lamp socket—¼ H. P. Reversing Motor connects directly to nearest lamp socket for power.



9" x 2½' New Model Junior Self-Contained Motor-Driven Bench Lathe, complete as shown $228

South Bend Lathe Works 632 E. Madison Street South Bend, Ind., U. S. A.

New York City Salesroom, 183 Centre Street

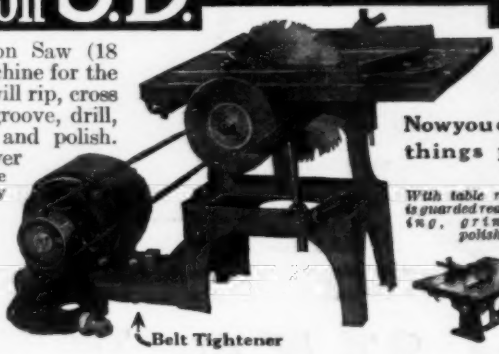
SOUTH BEND LATHES

18 Tools In One 8" Combination S&B SAW

Money Back Guarantee 15 DAYS TRIAL

The S&B 8-in. Combination Saw (18 tools in one) is the ideal machine for the shop, factory or the home; will rip, cross cut, bevel, miter, mortise, groove, drill, tenon, grind, rabbet, buff and polish. The greatest machine you ever saw; no other machine so complete and efficient as the S&B—actually 18 tools in one! You will marvel at the wonderful beveling, grooving, buffing, etc. All attachments are adjusted in a few seconds without any difficulty. Very little space is used and the motor is mounted on a base that is a part of the machine proper, this is an exclusive feature! The motor: ¼-H.P., 60-cycle, 110-volt A.C., run from any light socket also provides power for other purposes when the saw is not in use. Complete with attachments: 12-in. x 16-in. Table, 8-in. Combination Saw, Iron Pulley for Saw Table, 10-in. Ripping fence, Adjustable Cut-Off Miter Gauge, Motor ¼-H.P., 3-in. Iron Pulley, 6-in. Buffing Wheel, 5-in. Emery Wheel, 6-in. Sander, ⅜-in. 3-Jaw Drill Chuck, 1¼-in. Endless Leather Belt, 8-foot Cord and Plug, Saw Guard and 2-in. Dado Insert. Price $35.00, F.O.B. Chicago. Shipping weight 100 lbs.

$35 F. O. B. CHICAGO



(Planer attachment to fit on table top will smooth pieces up to 2 in. wide, $12.00 extra. Flexible Shaft Grinder attachment, $35.00 extra.)

Write for Complete Illustrated Folder

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Flexible shaft grinding attachment—especially good for metal patterns, routing, grinding, die-castings, etc.

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Absolutely Guaranteed

No more worry with "B" Batteries! Hook up a Perfect "B" Battery Eliminator and forget battery troubles forever. This wonderful new invention means better reception, sharper tuning. Gives you more real pleasure from your set.

No Tubes, No Harmful Acids, No "Extras" to Buy

Send $1.00

Operates perfectly on direct or alternating current, giving up to 90 volts current, and using the full wave of the power supply. Simple directions enclosed—anyone can plug it into any kind of set up to six tubes. Constant voltage gives set more power. Costs no more than set of good "B" Batteries.

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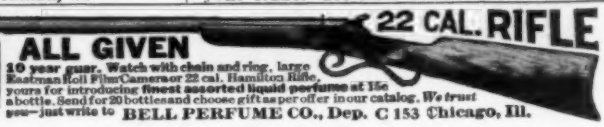

10 year guar. Watch with chain and ring, large Eastman Roll Film Camera or 22 cal. Hamilton Rifle, yours for introducing finest assorted liquid perfume at 15c a bottle. Send for 20 bottles and choose gift as per offer in our catalog. We trust you—just write to BELL PERFUME CO., Dep. C 153 Chicago, Ill.

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Westgale Sets are Licensed Under R. C. A. and Associated Companies Patents

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Buy at cost. We want Agents and Dealers in every locality to demonstrate and take orders for these amazing new 1928 Westgale Models. This is your chance to get a Westgale Radio at a big discount and make it pay you big money. Millions of radios will be sold this season. Get a Westgale set on 30 Days' Trial—demonstrate to your neighbors and friends and get your share of these big radio profits.

Your Own Radio FREE

Our new Catalog also explains a plan whereby you can put a Westgale Radio in your home on 30 Days' Trial—demonstrate it to your neighbors and friends in your spare time and get your own set without cost before the trial period is up.

24 Styles to Choose From

Table Styles—Consoles—De Luxe Cabinets

This season Westgale offers you 5 tube—6 tube—and 7 tube models in your choice of a beautiful array of table styles, consoles and period type Walnut cabinets.

Don't buy any radio until you send the coupon for our new catalog which pictures and describes our complete line in almost any size or style you could wish for. Don't wait,—a special introductory discount from retail prices for those who write quick. Mail the coupon today—get posted before you buy.

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FOR twelve years Cunningham Radio Tubes have been providing dependable tube service in millions of radio sockets.

You, too, may enjoy unfaltering radio reception by equipping your set throughout with Cunningham Radio Tubes.

Don't use old or inferior tubes with new ones—use new tubes throughout.

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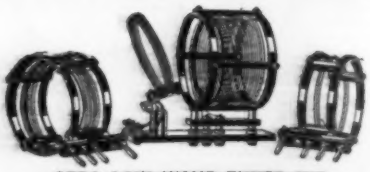
The Famous AERO SHORT WAVE KIT NOW IMPROVED



AERO LOW WAVE TUNER KIT

Code No. L. W. T. 125.....Price $12.50

Always the prime favorite of all experts and amateurs insistent upon the very best in short wave reception, the AERO Low Wave Tuner Kit for this season has been made even better than ever!

Range 13 to 725 Meters

The AERO Low Wave Tuner Kit illustrated above is completely interchangeable. The kit itself includes 3 coils and base mounting covering U. S. bands 20, 40 and 80 meters. You can increase the range of this kit to 725 meters by use of AERO interchangeable coils No. 4 and 5 (Price $4.00 each) or you can decrease the range to go as low as 13 meters by use of AERO interchangeable coil No. 0 (Price $4.00).

By all means build the new AERO Short Wave Set. The AERO coils used in its construction can be procured from your dealer or direct from our factory. We have also arranged to furnish the Westinghouse Micarta drilled and engraved panel for this receiver direct from our factory. Write us at once for full information.

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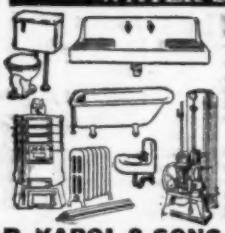
WATER SYSTEMS



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Finest materials all brand new and perfect. Tell us your wants and mail us a rough sketch of your rooms.

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Make $100.00 a week and up, selling our fine made-to-measure, all-wool suits, direct to wearer. **Biggest values—positively sell on sight.** Biggest commissions paid in advance. We attend to delivery and collections. 6 x 9 cloth samples — over 100 styles—furnished **FREE.** Ambitious men write at once.

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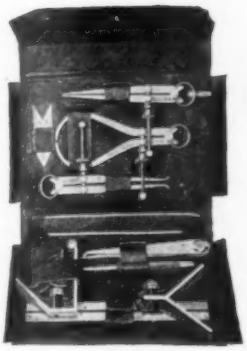

Starrett Set No. 900, in a handsome folding leather case, is made up of 6 inch Combination Square, complete; center punch, 6 inch flexible steel rule in pocket case, center gage, 4 inch inside and 4 inch outside calipers with solid nuts, and 4 inch dividers with solid nut.

Price $8.75.

"I hope to tell you that's a real present!"

Any man who is mechanically inclined will appreciate a gift like this.

The Starrett No. 900 Set is a kit he will be proud to own. It contains just the tools he needs to get started on precision work—each one of them made with the accuracy and quality which has made Starrett Tools the standard for good workmanship the world over.

Your tool dealer will gladly show you the Starrett No. 900 Set. Ask him or write us for a copy of the Starrett Catalog 23 "AP" illustrating and describing more than 2500 fine tools.

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Use Starrett Tools

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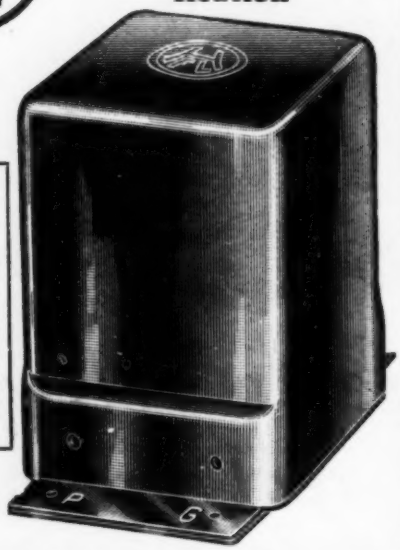
An Amazing Achievement in Audio Amplification



The new C-16 and C-25 Transformers will work in any circuit and will improve any Radio Set. Endorsed by America's Leading Engineers. Guaranteed by the Manufacturers

Two additions to last year's Radio Sensation

H.F.L. C-16 is the most efficient Audio Transformer built. It carries signals at highest volume and lowest amplitude without blasting or developing harmonics. Operates with all power tubes as well as standard tubes.

H.F.L. C-25 Output Transformer handles the voltage output of power amplifying tubes, at the same time matches the impedance of the average speaker to the tubes. Protects loud speaker unit without reducing plate voltage.

Mechanical features of these two transformers are: A coil designed and treated to exclude moisture and withstand heavy electrical surges without breaking down—complete magnetic shielding to avoid interstage coupling—terminals brought out so as to insure short leads.

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PRICES

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C-16 Transf.	8.00
L-425 R. F. Choke	5.50
L-430 R. F. Transform.	5.50
C-25 Output Transform.	8.00

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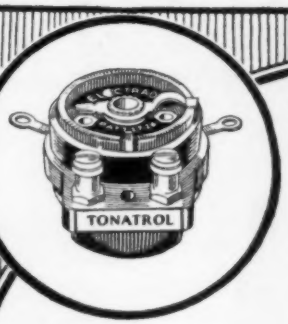

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Write for free installation booklet for the proper way to control volume.

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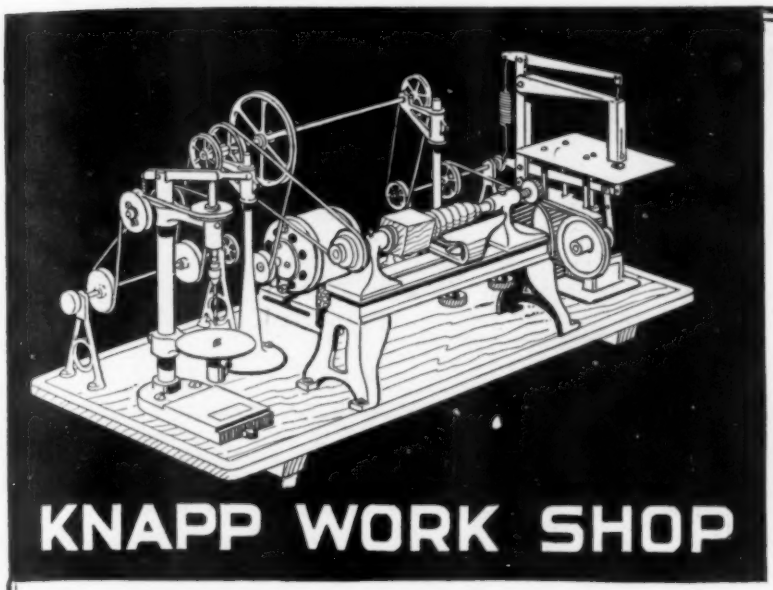

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Study the specifications of this ultra-quality line of dependable machine tools, selling at prices you can afford.

You can easily see the great advantages of owning an outfit like this. It can accurately handle the small turnings and do saw work, that now take so much time doing by hand on ship models and other work, and at the same time it is big and sturdy enough to handle up to ¾" lumber in the saw, turnings 2⅜" x 5" and will drill not only wood, but metals (iron, copper, brass, lead, aluminum), bakelite, celeron, slate, radio panels, etc.

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Outfit comes completely set up, ready to plug in to an electric light socket. Motor costs less to run than a 75 watt lamp. Or you may buy any of the tools separately.

This outfit is a worthy addition to any work room, and is handy in a hundred ways.

Go to your dealer and see a Knapp Work Shop—hardware, sporting goods stores, or department stores (toy dep't usually), or send 10c. in stamps for full color catalogue fully describing Knapp American Industry in Miniature.

Workshop No. 990 complete $27.50
Denver West $30.00

If your dealer is out of stock we will send for price plus carrying charges.

KNAPP ELECTRIC CORPORATION, PORT CHESTER, N. Y.
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Knapp Lathe, No. 930

Turns wood up to 5 in. length, 2⅝ in. diameter. Tool rest, head rest, tail stock all fully adjustable. Complete with 3 step pulley, 3 high grade cutting tools, and instruction book.

$6.00 Denver West $6.50
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Samples of work done on the Knapp Lathe with Outfit 935, consisting of 12 interesting and useful turning designs, and templates, 43 white pine blocks, 5 in. long, from ½ to 1½ in. diameter.

Outfit 935, $1.25
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Knapp Jig Saw No. 900

Capacity up to ⅜ in. lumber, also bakelite, celeron, etc. Handy for making radio panels, as well as jig saw and scroll work. Instruction book, wood with design laid out ready for cutting and 3 blades furnished.

$4.00 Denver West $4.25
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Sample of work done on Saw No. 900 from Outfit 902 which consists of 20 boards, 4½ x 12 x 3/16 in. and 12 designs for making everything from toys to practical household articles.

Outfit 902, $2.00
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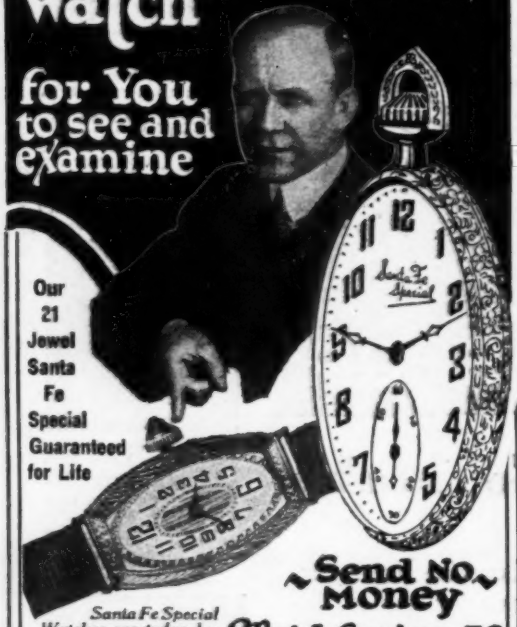
for You to see and examine



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$2.00 to $3.00 an hour at home during spare time, or a good steady income in business for yourself! A clean, dignified business. No canvassing. Pleasant and easy work. No studying, no rent, no experience needed.

FOLEY Automatic SAW FILER

The business is already waiting for you if you have a Foley. Practically every home has saws to be filed regularly. You can get the filing business from the manual training department of your school. Carpenters, contractors, factories and dozens of others will be your regular customers. You get $.50 or more for each saw. The Foley does the work automatically. Files and joints all kinds of saws. Electrically driven. This is a real opportunity for the man who honestly wants to make real money. If you are that man, write for free instructions on how to build up a saw filing business.

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A REAL Lathe. 9" swing; 30" between centers. Speedy and accurate. Special attachments and tools available.

12" Band Saw

Powerful, practical. Not a toy. Has tilting table. Saws 6" stock. Bronze bearings.

Write today for Circular and Prices on these and other machines.

Rossbacher Machine Co., 1816 Fernwood Ave, TOLEDO, OHIO

I Offer You $8.00 a Day and a

Write quick for new proposition. We offer $8.00 a day and a new Chevrolet Coach for demonstrating and taking orders for Comer All-Weather Topcoats and Raincoats. Spare time. No experience required. Sample outfit free. Write now.

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5 TUBE RADIO ONLY $19.98

It's a wonder for power and selectivity. Famous ARL circuit. Coast to coast reception! Finely built of selected, tested parts. Thousands now in use. **FREE Log and Call Book** and New 132-p. Catalog with thousands of nationally advertised bargains. Latest in radio at big savings. Write for Free copy.

AMERICAN AUTO & RADIO MFG. CO.
HARRY SCHWARTZBERG, PRES.
Dept. 261 American Radio Bldg., Kansas City, Mo.

AMERICAN RADIO BARGAINS

30 DAYS FREE TRIAL

Battery or
All-Electric
OPERATION

TRY this powerful seven-tube RANDOLPH RADIO for thirty days. After it **brings in stations from coast to coast** with amazing clearness—**with easy one dial tuning**—after it **easily equals any other radio**—after you are more than satisfied, then you can buy it **direct at factory prices. Every RANDOLPH must make good before it is sold.**

This RANDOLPH can be had for use with batteries or **connected direct to the electric light socket—absolutely batteryless—no batteries, chargers or acids—just plug in and tune in.** 100% efficient either way. Its construction and performance have been tested and approved by leading radio engineers and authorities—by leading radio publications and laboratories.

7 Tubes—Single Control
Illuminated Drum

One drum dial operated by one simple vernier control tunes in all stations with easy selectivity to tremendous volume. No overlapping of stations. Illuminated drum permits operation in the dark. Volume control for finer volume modulation. This is a seven-tube tuned radio frequency receiver with power transformers and power amplification. Space wound solenoid coils. Full and completely shielded. Tremendous distance, wonderful tone quality, simple to operate.

Beautiful Walnut Console
Built-in Cone Speaker

The Randolph Seven-tube Ampliphonic Console illustrated above is housed in a genuine burl-walnut cabinet with two-toned hand rubbed finish giving it unsurpassed beauty. The same expert cabinet work has gone into the making of these consoles as in the finest furniture. Has **built-in cone loud speaker that compares with any on the market.** Accurately reproduces complete range of musical notes from the highest to the lowest pitch.

What Users Say

I have logged more than 50 stations from coast to coast.—Lloyd Davenport, Littlefield, Texas. I have logged 52 stations from Cuba to Seattle, the set is a world beater.—J. Tampkinson, Detroit, Mich. Your set is a revelation, has all others tied to the post for distance and selectivity.—Waldo Powers, Vergennes, Vermont. On strength of its performance sold two more sets this week.—T. Scanlow, Orlando, Florida.

The Randolph 7-Tube Console Single Control RETAIL PRICE Completely Assembled $99

The Senior Six

Do not compare this set with old style 2-dial 6-tube sets selling for about the same price. The Randolph 1928 Senior Six has also been tested and approved by the leading radio engineers.

Beautiful solid walnut cabinet. Single control. Illuminated drum with space for logging. Very selective. **Sent for 30 Day's FREE Trial.**

6-Tube $55 Retail Price Single Control

MAIL COUPON NOW!

The Randolph Radio Corporation are pioneers in the manufacture of radios. Long and successful experience in the radio business makes us perfectly confident in sending Randolph Radio on trial. We know what it will do. Mail us the coupon for the greatest radio offer ever made.

Sensationally Big Discounts to Agents

Work either full or part time and make big money. Tremendous advertising campaign helps you sell. Regardless of whether you have ever sold before, be sure to get our proposition. The Randolph sells on first demonstration. Men and women both can make money this easy way. Get your demonstration set for thirty day's FREE TRIAL.

Use This Coupon NOW!

Randolph Radio Corporation
711 W. Lake St., Dept. 390
Chicago, Illinois

Send me full particulars about the RANDOLPH Six and Seven Tube All-Electric and Battery Table and Console Sets with details of your **30 Day FREE Trial Offer.**

Name .....

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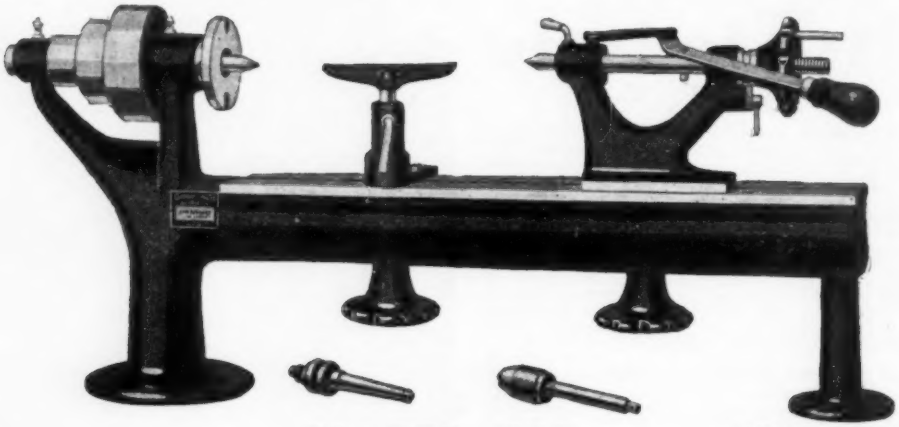
City ..... State .....

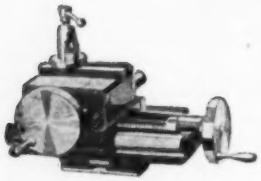
Mark here ☐ if interested in Agent's proposition.

RANDOLPH RADIO CORPORATION
711 West Lake Street Dept. 390 Chicago, Illinois

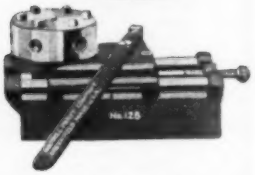
A *reliable* BENCH LATHE at a price you can afford



No 125—$40



No. 132 Slide Rest
List $17.50



No. 128 Turret Attachment. List $50.00

IF you don't require ultra precision, but do want a reasonably accurate lathe, this one will serve your purpose and meet your pocketbook.

This lathe is sturdily built and dependable, and is designed especially for use in trade schools, repair shops and the home workshop.

It has Milled Bed and Tail Stock with Milled Base, both Screw and Lever Feed and 3-Step Cone Pulley. Capacity: 7″ swing; 12″ between centers. Live Spindle fitted with cone bearing. Measures 25″ over all and is 11½″ high.

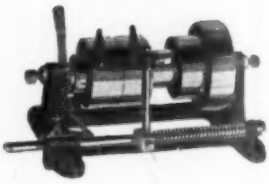
No. 125 . . . . List $40.00.

No. 494 Bench Lathe is similar, but has larger T Rest and longer bed. Capacity 7″ swing; 18″ between centers. List $44.00.

Either lathe can be driven by a ¼ H. P. motor.

Ask to see these Lathes and Accessories at your dealer's. Or write us for Lathe Booklet, which will be sent FREE on request.

No. 194 Saw Table
(saw not included)
List $17.50



No. 130 Countershaft
List $12.00

GOODELL-PRATT COMPANY, GREENFIELD, MASS., U. S. A.

MAKERS OF *Toolsmiths* MR. PUNCH

GOODELL-PRATT

1500 GOOD TOOLS

Installation FREE!

On ANY Radio Set!

The Marvelous New Model PHILCO Radio AB Socket Power

Runs Any Radio from Your Electric Current!

Yes, any Authorized Philco Dealer will connect the wonderful Philco AB Socket Power to *your* radio set—*whether it is an old set or a new set*—at no extra cost to you. Installation is FREE!

Built for All Radio Power Tubes and Will Deliver 180 Volts at 60 Milli-amperes

No Matter What Set You Own— No Matter What Set You Buy— Philco Will Run It From the Light Socket!

It makes no difference whether you now have a dry cell or storage battery operated set or what kind of battery radio set you buy, the Philco AB Socket Power will run it from the electric lighting current. Here is your chance to do away with the ordinary "A" storage battery and all dry cell "A" and "B" batteries. ***Super-power for all power tubes!*** No hum! No distortion! No more recharging to do! No more batteries to replace!

The Famous Philco AB Socket Power

Easy Payments!

You can buy the New Model Philco AB Socket Power from any Authorized Philco Dealer on Easy Payment Terms. Merely make a small first payment and pay the balance monthly.

Trade In Your Old "A" Storage Battery

You won't need it with the Philco. Any Authorized Philco Dealer will make you a *liberal allowance* for your old "A" storage battery when you buy the brand-new Philco.

Easy As Turning On Your Electric Light!

Merely snap ON your radio set switch when you want to listen in. Snap it OFF and your radio is silent. No fuss. No bother.

Every Philco Guaranteed!

Each and every Philco AB Socket Power is covered by an ironclad factory guarantee and is built to conform to Underwriters' Laboratories Safety Specifications.

Console-Cabinet Models

Console-Cabinet Models are built to fit *inside* the cabinets of practically all well-known radio sets, including:

Atwater Kent, Crosley, Pfanstiehl, Freed-Eiseman, Fada, Radiola-28, Victrola-Radiola, Brunswick-Radiola

Special Philco Units have been designed for Fada, Pfanstiehl, Freed-Eiseman, Stromberg-Carlson, Brunswick-Radiola, Kimz, Splitdorf and Victrola-Radiola and are tested and approved by these companies.

Clip and Mail Today!

Mail This Coupon NOW!

Just sign your name and address to this FREE Coupon, put it in an envelope and mail it to us. It does not put you under the slightest obligation. Then we will send you at once full descriptive literature on the New Model Philco AB Socket Power. We will also send you the full details of our liberal offer of Easy Payments, Free Installation and Trade-In Allowance.

Special FREE COUPON

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I shall be pleased to receive your free illustrated literature describing the famous Philco Radio AB Socket Power; also the full details of your Easy Payment, Free Installation and Trade-In Allowance Offer.

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Philadelphia Storage Battery Co.
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Philadelphia, Pa.

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Those who go through the Brown & Sharpe plant very frequently come out with the impression of having visited a mechanical world in itself.

Every facility exists in this plant for making Brown & Sharpe precision tools with almost unbelievable accuracy and for testing them with painstaking care.

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"World's Standard of Accuracy"

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Lowest wholesale prices on highest quality Grade A goods. Any Handy Man can install his own Plumbing and Heating BY OUR NEW EASY METHOD. Get the best and pay only a little each month.

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Direct from the manufacturer. Completely wired, including glassware. Send for new catalogue No. 28. Just Reduced Prices. *Special Proposition to Dealers.*

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Save 1/2

New Low Factory Prices Now Only

Our big new catalog—showing all standard make typewriters in full colors is ready. Reduced prices are in effect. Our 25,000 satisfied customers prove conclusively that we save you over one-half by our direct-to-you selling plan.

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On 10 Days' Free Trial

Think of it—only $2.00 down brings you your choice of these world-famous standard-make typewriters—direct from our factory, on 10 days' Free Trial. Balance of greatly reduced price on easy monthly payments. Our new direct-to-you sales plan saves you over 50% to 60% regular price. Quality the very highest—and prices the very lowest. Every typewriter carries a 10-year written guarantee of perfect satisfaction.

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This amazing offer enables you to try your typewriter 10 full days Free before you buy. Every machine is full standard size—late model with all up-to-date improvements including back spacer, automatic ribbon reverse, tabulator, two-color ribbon, etc.,—all completely rebuilt and refinished brand new. Every machine a real bargain.

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Send for this new book **Now.** Learn how International gives you your choice of any high-grade, standard-make typewriter, good as new in every respect, at less than half the regular price. Also explains our easy monthly payment plan,—over a year to pay.

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Famous Van-Sant Course in Touch Typewriting FREE

Just think what it means to get any one of these world-famous standard-make typewriters—regular $100 to $125 values—at less than ½ price and only $2 down. That is what this remarkable offer means if you act at once.

Special Limited Offer

For a limited time only we are offering the famous Van-Sant Home Study Course in touch typewriting, Free with any typewriter you select. This is the same recognized system as used and taught by many leading business colleges today. Send for beautiful big catalog and special offer at once—before it expires.

International Typewriter Exchange,
184 W. Lake Street, Dept. 1294, Chicago.

Gentlemen:

Please send me your big Free Catalog showing reduced prices on all standard-make typewriters. Also your 10-day Free Trial, and Free Course in touch typewriting offer.

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A Sensational Success!

Over 25,000 sold the first 6 months

They are Enthusiastic

All three Eliminators received from you are working well and the owners are entirely satisfied to say the least. One is working on 60 cycle current, another on direct current, and the other is on 25 cycle current in Windsor, Canada. I am thoroughly convinced in your statement that they will operate on any lighting circuit or any frequency. J. G. Mullan, Detroit, Mich.

Wish to tell you I consider your Eliminator the best piece of radio equipment I have ever bought. I was surprised with the fine performance and construction. Ed Seager, Hamilton, Ont., Canada.

I could scarcely wait to report to you the fine results of your Eliminator. Since receiving it the house has been filled with fine clear music, the local stations tune very sharply and the increase in volume is remarkable. We never want to use noisy B Batteries again. It is the best bargain I have struck and I wish to compliment you on this Eliminator. Frederick Lyon, Seattle, Wash.

Have been using your Eliminator since last February and it certainly works fine. Fred A. Peters, Dallas, Texas.

You will be enthusiastic, too!

Overwhelming evidence that VALUE is quick to be recognized and appreciated.

Unsurpassed quality is built into the Townsend "B" Socket Power Unit with money *saved* by *unified* production methods and lower merchandising costs.

You get more—you pay far less—for the most remarkable value in Radio today.

New thousands of Radio set owners are learning this daily by installing Townsend "B" Socket Power.

Sold on REAL GUARANTEE OF MONEY BACK IF NOT SATISFIED. Delivers up to 100 volts on any set, on D. C. or A. C.—any cycle. Full tone, clarity and volume.

Send Order Today Simply fill out the coupon and slip it into an envelope with only $1.00 and mail it at once. Your Townsend "B" Socket Power Unit will be sent promptly. Deposit only $5.85 plus postage with the postman. Try out for 10 days—then if it does not do everything we say, return it to us and purchase price will be refunded.

10 Days FREE TRIAL
You are the Judge!

Townsend "B" Socket Power

Townsend Laboratories
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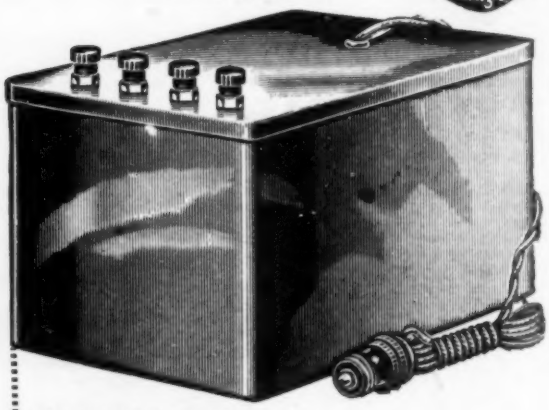
Approved and passed by the rigid laboratory tests of Popular Radio and Radio News.



Complete $6.85
$1.00 Down
Balance C.O.D.

Attach only $1.00 to this coupon

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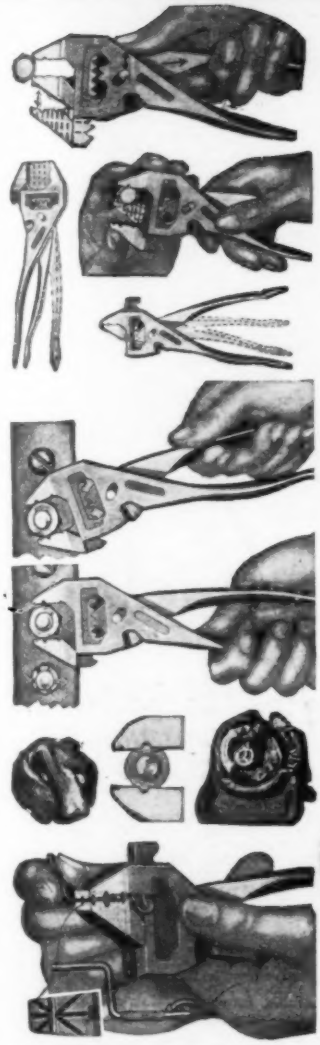
"Why-It's a Whole Machine Shop!"

Its Grip Locks

AN APPRECIATED XMAS GIFT



—that is what Users call the EIFEL-FLASH PlieRench KIT, because instead of using a dozen tools on One job they do a thousand jobs with the PlieRench KIT alone! And if this page could show "Mechanics" readers what this Kit can do for them, the Kits reserved for the Special Offer below would not last one day, but—space permits only "a word to the wise."

Helped Win WORLD FLIGHT

USED BY U. S. World Flyers; on U. S. S. Shenandoah, S. S. Leviathan, U. S. Army, Navy, and Mail Planes. By MAKERS of Buick, Chevrolet, Nash, Packard, Reo, Studebaker, etc., Automobiles; each with its employees buying from 200 to 1000 Kits.

Thousands of Housewives are using the PlieRench too, because it is the only tool giving a woman's hand a ½-TON grip and enabling her easily to do mechanical work difficult for a man using other tools!

A SUPER PLIER-WRENCH-VISE WITH A 1-TON POWER-GEAR

The PlieRench out-speeds, out-works and outwears, dozens of best other tools in an incomparably superior way. In 1/8 second the Ratchet Gear-shift fits the Jaws to the work and the handles to the size of Your hand. The One-Ton POWER-GEAR automatically LOCKS and releases the grip on the Corners and "flats" of Any shape and in addition applies ½ to 1 TON Direct pressure—64 to 128 TONS per square inch! It is a Perfect Ratchet Turning Wrench!

OUTGRIPS A 40-POUND VISE!

The force of the 1-TON PlieRench Grip is beyond belief—it must be experienced. It Out-grips a 40-LB. VISE; twists round heads off ¼-in. stove bolts and heads off ½-in. Bolts! It will easily, instantly, remove worn, chewed, and chiseled, nuts, broken taps, drills, studs, etc., in tightest places, with next-to-nothing to get hold of—when all other tools fail!

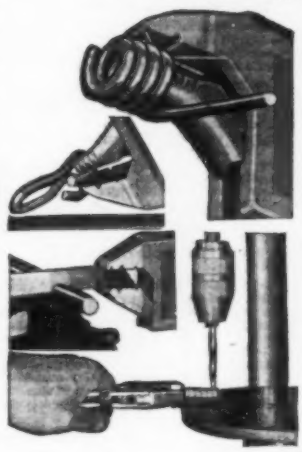
Its smooth Jaws with 4-Way V-Grooves will hold a hair, and all possible shapes from 0" to 1½" diameter with a rigid, clinching grip that never chews or slips one bit. They coil 1/16" to 1" diameter springs of fine and heavy spring wire, and—do a thousand other "impossible" things quickly and easily.

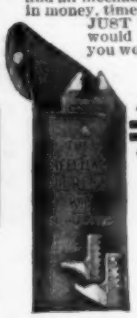
ALL TOOLS in a 24-Ounce KIT

The PlieRench Kit is a Guaranteed, Time-perfected, Super-quality Master Tool, having a Universal Utility that defies Imagination. "The PlieRench Way" Manual of Mechanics—64 Pages with 145 Pictures—shows most valuable uses and advantages!

HUNDREDS OF THOUSANDS of men are using these wonder Kits to make their Homes and Estates more comfortable—Farms, Shops, etc., more profitable; to get more and better service from Automobiles and all mechanical devices, with an enormous saving in money, time and energy!

JUST TRY a PlieRench Kit once, and you would no more go back to other tools than you would to the ancient Ox-cart!





Ltd. Special Introductory PRICE ONLY $3.75

(Regular Price $5.00)

The KIT has 3 Gear-Jaws. In 1/8 Second you convert the Universal PlieRench into the Pipe-and-Fitting PlieRench, or into the Wire-Chain-Cable PlieRench—each the Master in its field.

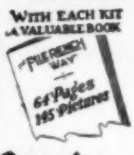
This $5.00, 1½-Lb., Kit will do the work of 60 Lbs. of other tools costing $50.00—Quicker, better, easier.

MAKES WONDERFUL GIFTS

Show on Coupon. Kits Wanted on 2-Weeks' MONEY - BACK OFFER—

MAIL TODAY, SAVE $1.25 PER KIT!

WITH EACH KIT A VALUABLE BOOK



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PlieRench representatives earn amazing incomes demonstrating this wonderful new tool. One man alone sold nearly 10,000 in just one state. Fastest seller known. Factories buy by hundreds. Every auto and home owner buys. We have wonderful special proposition to agents. Mail coupon for full details. Why not earn $75 to $200 and more a week, spare or full time!

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☐ Rush ( ) Kits (If S. A. Price) with Postman on arrival.
If not delighted I may return within 2 weeks and deposit will be refunded at once.
☐ Send me only one Herculum.
☐ Am interested in Salesman's Big Proposition.

Name .....

R.F.D. .....

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A Sensational Success!

Over 25,000 sold the first 6 months

They are Enthusiastic

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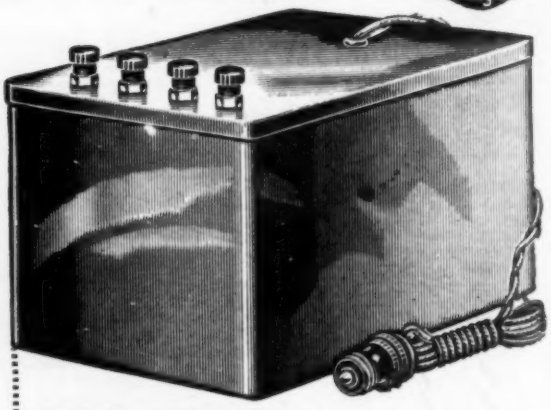

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Name.....

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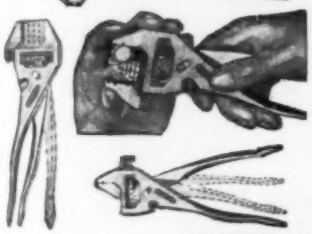
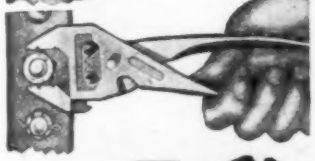
Its Grip Locks

AN APPRECIATED XMAS GIFT





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Helped Win WORLD FLIGHT

USED BY U. S. World Flyers; on U. S. S. Shenandoah, S. S. Leviathan, U. S. Army, Navy, and Mail Planes. By MAKERS of Buick, Chevrolet, Nash, Packard, Reo, Studebaker, etc., Automobiles; each with its employees buying from 200 to 1000 Kits.

Thousands of Housewives are using the PlieRench too, because it is the only tool giving a woman's hand a ½-TON grip and enabling her easily to do mechanical work difficult for a man using other tools!

A SUPER PLIER-WRENCH-VISE WITH A 1-TON POWER-GEAR

The PlieRench out-speeds, out-works and outwears, dozens of best other tools in an incomparably superior way. In 1/8 second the Ratchet Gear-shift fits the Jaws to the work and the handles to the size of Your hand. The One-Ton POWER-GEAR automatically LOCKS and releases the grip on the Corners and "flats" of Any shape and in addition applies ½ to 1 TON Direct pressure—64 to 128 TONS per square inch! It is a Perfect Ratchet Turning Wrench!

OUTGRIPS A 40-POUND VISE!

The force of the 1-TON PlieRench Grip is beyond belief—it must be experienced. It Out-grips a 40-LB. VISE; twists round heads off ¼-in. stove bolts and heads off ½-in. Bolts! It will easily, instantly, remove worn, chewed, and chiseled, nuts, broken taps, drills, studs, etc., in tightest places, with next-to-nothing to get hold of—when all other tools fail!

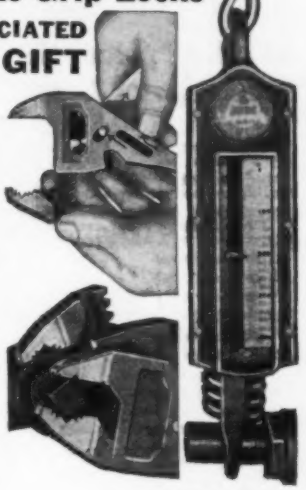
Its smooth Jaws with 4-Way V-Grooves will hold a hair, and all possible shapes from 0" to 1½" diameter with a rigid, clinching grip that never chews or slips one bit. They coil 1/16" to 1" diameter springs of fine and heavy spring wire, and—do a thousand other "impossible" things quickly and easily.

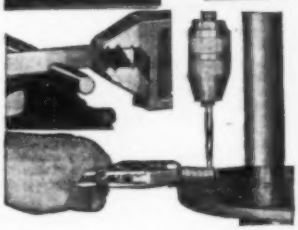
ALL TOOLS in a 24-Ounce KIT

The PlieRench Kit is a Guaranteed, Time-perfected, Super-quality Master Tool, having a Universal Utility that defies Imagination. "The PlieRench Way" Manual of Mechanics—64 Pages with 145 Pictures—shows most valuable uses and advantages!

HUNDREDS OF THOUSANDS of men are using these wonder Kits to make their Homes and Estates more comfortable—Farms, Shops, etc., more profitable; to get more and better service from Automobiles and all mechanical devices, with an enormous saving in money, time and energy!

JUST TRY a PlieRench Kit once, and you would no more go back to other tools than you would to the ancient Ox-cart!





Ltd. Special Introductory PRICE ONLY $3.75

(Regular Price $6.00)

The KIT has 3 Gear-Jaws. In 1/8 Second you convert the Universal PlieRench into the Pipe-and-Fitting PlieRench, or into the Wire-Chain-Cable PlieRench—each the Master in its field.

This $5.00, 1½-Lb., Kit will do the work of 60 Lbs. of other tools costing $50.00—Quicker, better, easier.

MAKES WONDERFUL GIFTS.

Show on Coupon. Kits Wanted on 2-Weeks' MONEY - BACK OFFER—

MAIL TODAY, SAVE $1.25 PER KIT!

WITH EACH KIT A VALUABLE BOOK

Agents: $200 a Week

PlieRench representatives earn amazing incomes demonstrating this wonderful new tool. One man alone sold nearly 10,000 in just one state. Fastest seller known. Factories buy by hundreds. Every auto and home owner buys. We have wonderful special proposition to agents. Mail coupon for full details. Why not earn $75 to $200 and more a week, spare or full time!

THE FLASH SALES CORP'N

LP-4809 N. Ashland Ave., CHICAGO, ILLINOIS

The Flash Sales Corp'n, LP-4809 N. Ashland Avenue, Chicago, Ill.

☐ Rush [illegible] Kits, with deposit $3.75 each (U. S. A. Price) with Postman on arrival. If not satisfied I may return within 2 weeks and deposit will be refunded at once.

☐ Send me only user literature.

☐ Am interested in Salesman's Big Proposition.

Name.....

R.F.D. St.....

P.O. Out.....

State.....

$55.

At this price the Crosley Bandbox is Radio's most astonishing success, *not* because the price is low, *but* because the set is magic!

Millions are making up their minds today to buy a radio.

Millions will replace obsolete sets with new, up-to-date receivers this fall.

Experienced radio owners will look first for 3 fundamental points and to every set they consider will address these questions:

1. Is it selective?
2. Is it sensitive?
3. Is it easy to operate?

Satisfied on these points they will look for:

1. Single dial control.
2. Illuminated dial.
3. Volume control.
4. Single cable leads.
5. Console installation adaptability.
6. Reasonable price.

Millions will look at the Crosley Bandbox. This amazing little set is now displayed by more than 16,000 dealers.

The Crosley Bandbox is a 6-tube receiver.

The circuit of this set is of the excellence you would expect from a group of skilled engineers suddenly given the pick of the world's radio patents to work with.

Crosley has always given the radio world its biggest value for its dollar. Contemplate the perfection possible when the doors of the research and development laboratories of The Radio Corporation of America, The General Electric Co., The Westinghouse Co., The American Telephone & Telegraph Co., and the Hazeltine and Latour Corporations were thrown open.

Licensed under their patents!

Simply it means that millions will possess the best radio performance possible at the low prices for which Crosley is already famous.

The Crosley Bandbox is totally and completely shielded. Every element is absolutely separated from every other element by solid shielding. Coils are covered with copper. This could have been done cheaper but efficiency would have been sacrificed. Condensers are housed in cadmium-plated steel. All wiring is separated and shielded from all other parts of the receiver. Solid, sturdy, substantial, the entire set is assembled on a heavy metal chassis.

The tuned radio frequency amplification stages have been absolutely balanced through use of the Neutrodyne principle. The set is a genuine Neutrodyne!

To the initiated this means much. To the layman it manifests itself only as a radio receiver that does not squeal or howl when you are trying to get a station.

The shielding makes the Bandbox highly selective—the circuit, acutely sensitive and the design, extremely easy to operate.

The Bandbox is operated with a single station selector (one dial).

"You're *there* with a Crosley"

6 Tube Crosley BANDBOX $55

In most localities and in most owners' hands the single station selector will find all the programs anyone could possibly wish. But there are some owners who demand greater ability like the possessors of 90 horse power motor cars who may never step on it but like to be conscious it's there. For such have the Acuminators been designed. Far away stations of weak power but perhaps good music are captured by the use of these little auxiliary tuners. Their function is best likened to a pair of field glasses. As the lens bring the distant scene to nearby aspect, so do the acuminators bring the remote station signals up to room filling volume. Ordinary one dial radios can never perform like this. Hair line tracking of the condensers together is difficult—but the acuminators, little secondary adjustments *exclusive* to Crosley give the Bandbox a substantial command of the air and *all* that is in it.

The dial of the Bandbox is illuminated. For shadowy corners and dim eyesight it recommends itself.

Volume control is necessary on good radio today. Nearby and high powered stations send terrific impulses into the receiver. Detuning has been a favorite method of softening this loud reception but with stations closer and closer together on the dial detuning particularly in large cities creates an overlapping of programs. The ear like the eye is only good for one thing at a time. Under the towers of the heaviest stations the volume control of the Bandbox cuts the loudest blast down to a veritable whisper.

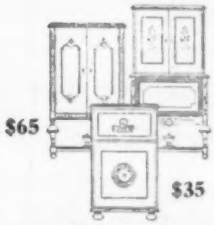
A single cable leads all outside and power connections from the Bandbox.

The adaptability of the Bandbox to installation in all types of cabinets is a feature. The metal case of the Bandbox lifts off the chassis. This leaves the closely grouped dial, switch and volume control shafts to be stuck through holes in the panel of any sort of cabinet. The escutcheon is quickly screwed over them and the console installation is not only complete but has no earmarks of a makeshift.

Much has influenced the $55 price of the Bandbox.

Back before radio became the entertainment force it is today Powel Crosley, Jr., held an ideal that the things which give people pleasure should be made to sell at low prices so that millions may enjoy them.

Throughout the country millions examine the Bandbox today. They see it the achievement of an organization who began its development when radio as we know it today began. Its success has been tremendous if clamorous demands from dealers are any indication. Even at any price it would be a sensation, for its performance ranks with the most expensive radio receivers on the market.



APPROVED CONSOLES

"I want the public to have as great a value in consoles this year as I have given them in the Bandbox," said Powel Crosley, Jr.

Prominent furniture manufacturers thru their long experience promised beautiful cabinets at moderate prices. Designs submitted were admired, praised, tested, approved! The Musicones were built in. Crosley dealers now sell them. Purchasers may know they are best suited for Crosley radio by looking for the "approved label" in each one. Crosley dealers get these cabinets only from The H. T. Roberts Co., located at 1340 S. Michigan Ave., Chicago. Sales representative for The Showers Brothers Co., Bloomington, Ind., and the Wolf Manufacturing Industries, Kokomo, Ind.

Write Dept. 15 for descriptive literature.

CROSLEY RADIO

THE CROSLEY RADIO CORP.
Powel Crosley, Jr., Pres.
Cincinnati, Ohio

Crosley is licensed only for Radio Amateur, Experimental and Broadcast Reception.

Montana, Wyoming, Colorado, New Mexico and West prices slightly higher.

Start to Play Very First Day

PARENTS!

What greater gift can you confer on your children this year than lifelong fun and entertainment?

Love of music means love of home, an appreciation of the finer things in life. Here is a chance to give your boy or girl that love without the tedious practice that most instruments require. The Xylorimba is *easy* to play. No teacher is needed. Practice is actually a joy.

Remember, the Xylorimba is the guaranteed product of a company established nearly half a century ago—a company that stands back of every promise it makes.

THINK of the best Christmas gift you have ever received. Multiply the pleasure it gave you by ten, and still you have only an idea of the joy you can give yourself this Christmas if you act at once!

Start to Play the Very First Day!

Haven't you, like millions of others, envied the fellows who "bring down the house" with snappy xylophone or xylorimba numbers? Haven't you longed to create your own music, to be looked up to wherever you go, to be able to make real money in spare time? If you have, this ad spells O-p-p-o-r-t-u-n-i-t-y. The xylorimba—wonderful for home, in demand at dances and gatherings—is nevertheless *the easiest of all instruments to play.* In fact, on the very day you get yours you play simple melodies, even if you can't read a note of music right now. In a few weeks you astonish your friends and family. *All your life* you have the joy that comes to those who can entertain.

Plays 20 Minutes; Gets $20!

Ralph Smith, Chicago, played twenty minutes at wedding; his "pay" was $20. Altho only 12, Turk McBee, Jr., plays big-time vaudeville exclusively. Harry Breuer, New York, has made thousands of friends thru his xylophone selections on the radio. L. E. Hallman, Reading, Pa., writes: "Made $300 in 5 weeks—spare time."

And now J. C. Deagan, Inc., (world's largest manufacturer of xylophonic instruments) has made it so easy to own a xylorimba that nothing stands in your way. Sizes and styles to fit every age and pocketbook. A five-day free trial that eliminates risk. Free, easy lessons that make teacher unnecessary—and, best of all, such easy payments that they are hardly noticed.

Will You Investigate?

Everyone wants to be popular. Everyone wants to make extra money. Everyone wants to be *center of attraction* at gatherings. But these advantages don't come by themselves. Opportunities must be seized. This is *your* opportunity — will you pass it up without investigation? The accompanying coupon will bring our big FREE book to your door. It tells all about the Deagan line, the free trial, the easy payments. Remember, no cost or obligation! Simply fill in and mail the coupon — but do it before it slips your mind. Today is as good a day as any. Do it NOW!

YOUR MAGIC KEY *to Popularity*

Send for BIG FREE Book!

Mail Now!

J. C. DEAGAN, Inc.
Dept. 1459, 1770 Berteau Avenue, Chicago
Please send me full details on the Free Trial offer and easy payment plan of the Deagan Xylorimba.

Name.....
Address.....
City.....
State.....

And Now A MACHINE To Make Shaving 50% Easie and 100% Cheaper!

Unique Invention Arouses a Whirlwind of National Interest! . . . Achieves Amazing Records of Unbelievably KEEN, Cool Shaves . . . Special Introductory Offer in Force Right Now!

MAKES ONE BLADE LAST 365 DAYS

THIS is the age of amazing scientific discoveries. And now comes the most surprising invention of all;—a **machine** that absolutely revolutionizes shaving!

Just think of a device that can take **any** ordinary razor blade on the market and multiply its sharpness 50% to 100% in exactly 11 seconds! And just imagine what a slick, painless shave you can get when your blade is just about **twice** as keen as any you have ever tried before!

No More Blades to Buy

But that isn't all. KRISS-KROSS not only strops blades to unbelievable sharpness—but it makes them **last almost indefinitely!** Day after day—week after week—you can keep using the same old blade and still get smoother, better shaves than you now get from a blade right out of a fresh package! Any number of cases are on record where one blade has lasted over a year and is still going strong. And M. T. Main of Kenosha, Wisconsin, has used one single blade for more than **five solid years** of the coolest shaves he ever got in his life!

Rejuvenates All Makes of Razor Blades

KRISS-KROSS is so remarkable that it is more a **blade-rejuvenator** than a stropper. It embodies 7 mechanical features that have long baffled inventors. Works on all brands of blades except Durham. Reproduces the magic diagonal stropping-stroke of the master barber. Reverses blade automatically, first one side and then the other. Starts with strong pressure and finishes **light.** Nickel jig flies up to notify you when blade is ready with **the keenest cutting edge steel can take!**

Generous Introductory Offer

KRISS-KROSS is never sold in stores—but only through authorized representatives in each locality. Right now, we are making a generous offer and are giving a new kind of 3-way, adjustable razor **FREE** to introduce KRISS-KROSS. Use the coupon below to get details of this unusual invention and offer. See for yourself how ingenious KRISS-KROSS is and what undreamed of shaving comfort it holds in store for you. No obligation. Clip the coupon now. Mail it to-day!

Wonderful Xmas Gift!

KRISS-KROSS makes a novel and unique Xmas gift that will be remembered for years to come. Attractively boxed in holly wrapper for holiday season. Inexpensive. Also ideal remembrance for business houses to give employees or special customers.

Ag ts $30 a Day

KRISS-KROSS is an astonishing money maker brings excellent profits men who are willing to our representatives in home territories. Many $30—$60 a day and are making $5000 and a year clear profit. time agents often take —$12 an evening and $200 a month. We give an extremely generous position and show you how to get started the way. Write for information and see just exactly what offer. It will pay you to vestigate. Check bottom line of coupon below mail it to-day!

Rhodes' KRISS KROSS STROPPER

RHODES MFG. CO., Dept. W-372
1418 Pendleton Ave. ST. LOUIS, MO.

Rhodes Mfg. Co., Dept. W-372,
1418 Pendleton Ave., St. Louis, Mo.

Without obligation, please send me complete illustrated explanation showing how KRISS-KROSS rejuvenates all types of razor blades (except Durham). Also give me details of your special introductory offer and the Free 3-way razor you are giving as a present.

Name.....

Address.....

Town.....State.....

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